

4.0 ENVIRONMENTAL ANALYSIS

This section describes the affected environment as it currently exists and discusses the environmental consequences of the proposed project. The discussion is organized by the following major resource topics: geology; soils and sediments; water resources; biological resources; land use, recreation, and visual resources; socioeconomics; transportation; cultural resources; air quality; noise; reliability and safety; cumulative impacts; and growth-inducing impacts.

The environmental consequences of constructing and operating the Long Beach LNG Import Project would vary in duration and significance. Four levels of impact duration were considered: temporary, short term, long term, and permanent. Temporary impact generally occurs during construction with the resource returning to preconstruction condition almost immediately afterward. Short-term impact could continue for up to 3 years following construction. Impact was considered long term if the resource would require more than 3 years to recover. A permanent impact could occur as a result of any activity that modifies a resource to the extent that it would not return to preconstruction conditions during the life of the project.

The specific criteria used to determine the significance of an impact are presented at the beginning of each major resource section. Unless otherwise noted, all identified impacts are considered to be potentially significant adverse impacts before applying SES' proposed mitigation (i.e., control measures). If any impacts remain significant (i.e., continue to exceed the significance criteria) after SES implements its proposed control measures, the FERC and POLB staffs developed additional mitigation in an effort to reduce any significant impact to a less than significant level. These recommended mitigation measures appear offset with bold type in the text. The staffs of the FERC and the POLB will recommend to their respective Commissions that these additional mitigation measures be included as specific conditions to any approvals issued by the FERC and the POLB for the Long Beach LNG Import Project.

The conclusions in this EIS/EIR are based on the analysis of the environmental impact and the following assumptions:

- all applicable laws and regulations would be complied with;
- the proposed facilities would be constructed as described in section 2.0 of this EIS/EIR; and
- the control measures included in SES' applications and supplemental submittals to the FERC and the POLB would be implemented.

4.1 GEOLOGY

4.1.1 Significance Criteria

Impacts on the geologic environment would be considered significant if:

- construction activities or the siting of project facilities would worsen existing unfavorable geologic conditions;
- construction or operation of the project would preclude or disrupt the development of mineral resources; or
- project construction would result in damage or loss of vertebrate or invertebrate fossils that are considered important by paleontologists.

Impacts of geologic hazards on the proposed project would be considered significant if:

- earthquake-induced ground motion or liquefaction would cause damage to the LNG terminal, pipelines, electric distribution facilities, or shoreline structures that would expose the public to substantial risk of injury.

4.1.2 Geologic Setting

4.1.2.1 Environmental Setting

The facilities and work areas associated with the Long Beach LNG Import Project would be located within the Pacific Border physiographic province, which consists of rugged coastal and inland mountain ranges separated by broad, flat basins. More specifically, the project would be located on the southwest edge of the LA Basin, an alluvial plain created by tectonic subsidence and subsequent filling by sediments eroded from surrounding mountains. The LA Basin is bounded to the north by the Santa Monica Mountains, to the east by the Santa Ana Mountains and the San Joaquin Hills, and to the south and west by the Pacific Ocean. The basin is a coastal plain of low relief that slopes gradually seaward. Topography in the project area ranges from approximately 20 feet above mean sea level (msl) at the proposed LNG terminal site to between 5 and 15 feet above msl along the pipeline routes.

The LA Basin is situated within the active boundary zone between the North American and Pacific tectonic plates. In the project area, the width of the boundary zone extends more than 220 miles from the offshore San Clemente fault zone to the eastern California shear zone in the Mojave Desert. Deformation along the boundary zone is predominantly right-lateral strike-slip, but is complicated in the Los Angeles area by compressional deformation along the “Big Bend” in the San Andreas fault zone, about 50 miles northeast of the POLB, and by changes in regional tectonics over the last 4 to 5 million years. Deformation in the area is now accommodated by northwest-trending right-lateral strike-slip faulting of the San Andreas system and other parallel faults, east to northeast-trending left-lateral strike-slip and reverse oblique-slip faulting, and west to northwest-trending thrust and reverse faulting (Walls et al., 1998).

The LA Basin is underlain by a major structural depression that has been the site of subsidence and deposition since the Miocene epoch (5 to 23 million years ago). The POLB is located over the southwest flank of the Wilmington Anticline, a northwest-southeast trending, basement-cored fold situated on the upper plate of the THUMS-Huntington Beach (THUMS-HB) fault. Recent studies by the USGS indicate that sediments as young as early Holocene (approximately 11,000 years old) are deformed

over the Wilmington Anticline, but there is no apparent faulting of these sediments or older strata in the project area (Edwards et al., 2001, 2002, 2003). Faults and seismic activity in the project area are discussed in section 4.1.4.1.

The project area is underlain by fill materials, alluvial and marine sediments, sedimentary rocks, and metamorphic basement rocks. Terminal Island is a largely manmade island that has been constructed and expanded since the early 1900s through various reclamation projects. Most of the infilling was by hydraulic methods; however, land-based materials were placed by mechanical methods after the occurrence of subsidence in the area (see section 4.1.4.2). Fill ranging in thickness from approximately 45 to 60 feet below ground surface (bgs) was encountered in all of the geotechnical soil borings conducted at the LNG terminal site (URS, 2003a). The upper 20 to 25 feet of fill beneath most of the southern portion of the terminal site is fine grained, whereas the upper 20 to 25 feet of fill beneath the northern portion of the terminal site is more coarse grained. Below a depth of about 25 feet, the fill materials across the entire LNG terminal site consist of predominantly loose to medium dense sands and silty sands, with layers of medium stiff to stiff fine-grained materials.

Beneath the fill materials at the LNG terminal site are 20 to 35 feet of silt and clay estuarine deposits. The estuarine deposits are underlain by predominantly marine sands to the maximum depth explored of about 160 feet bgs. Quaternary (1.8 million years ago to present) sand, silt, and clay deposits are estimated to be approximately 5,000 feet thick in the project area, and as much as 15,000 feet thick near the depositional center of the LA Basin located several miles to the north (Davis and Namson, 1998).

Quaternary deposits in the project area are underlain by approximately 10,000 feet of Tertiary (65 to 1.8 million years ago) sedimentary rocks that are underlain by Mesozoic (245 to 65 million years ago) metamorphic basement rocks (Davis and Namson, 1998). The Tertiary sedimentary rocks also expand towards the north, attaining a thickness of at least 25,000 feet near the center of the LA Basin. Tertiary and Quaternary units also thicken to the southwest, off the southwest flank of the Wilmington Anticline.

Similar fill and sedimentary deposits would be crossed by the electric distribution facilities and the southern 1.4 miles of the pipeline routes. Surficial deposits from MPs 1.4 to 3.8 of the pipeline routes have been mapped as soft clay, silt, silty sand, and sand of distal fan deposits associated with the active Los Angeles River system. Older alluvial deposits, generally described as dense to very dense sand and silty sand, are present at the surface from MPs 3.8 to 4.6 of the C₂ pipeline route.

4.1.2.2 Impact and Mitigation

Construction of the LNG terminal, electric distribution facilities, and pipelines would occur primarily within near-surface non-native fill deposits and unconsolidated soils and sediments. The construction laydown and worker parking area is gravel-covered and would not require any surface disturbance. Therefore, construction and operation of the Long Beach LNG Import Project would not materially alter the geologic conditions of the area or worsen existing unfavorable geologic conditions. No blasting would be required for construction of the project facilities. Effects from construction would be limited to disturbances to the existing topography due to grading, tank foundation excavation, pipeline trenching activities, and improvement of subsurface materials at the LNG terminal site by pile driving and the installation of stone columns. Foundations and soil improvements are discussed in section 4.1.4.3. As discussed in section 2.3.1.1, approximately 1 foot or 40,000 cubic yards of soil would be stripped by SES from the LNG terminal site following demolition and removal of the existing structures at the site by the POLB. Where necessary, soft areas would be over-excavated and filled with structural fill and the site would be brought up to final grade. Pipeline trenching would result in temporary, localized, and minor disturbance to near-surface fill and geologic materials. Once pipeline construction activities are complete in a given section, the grade and drainage patterns would be reestablished. As a result, impacts associated

with the Long Beach LNG Import Project on the overall geologic setting of the area would be less than significant. A discussion of the potential effects of geologic hazards on the LNG terminal site facilities is presented in section 4.1.4.3.

4.1.3 Mineral Resources

4.1.3.1 Environmental Setting

Due to the local geologic conditions, historic infilling, and urban setting of the project area, the only mineral resource in the area is petroleum.

Petroleum production began shortly after the 1932 discovery of oil on the Wilmington Anticline, which partly underlies the project area. Oil production has primarily occurred from sedimentary rocks at depths of around 4,000 feet.

There are no active petroleum production wells located within the LNG terminal site boundaries. The nearest active oil well is located approximately 75 feet east of the proposed LNG terminal site and is presently shut-in. There are 8 abandoned production wells adjacent to the terminal site, and the pipeline routes are adjacent to over 40 other abandoned production wells. Additionally, the LNG terminal site is crossed by a number of pipelines associated with oil production, water injection, former naval operations, and more recent POLB activities (URS, 2003a).

4.1.3.2 Impact and Mitigation

Underground pipelines that serve oil wells in the area could be encountered during project construction. All active and inactive pipelines encountered during LNG terminal site preparation would be relocated, removed, or abandoned in place using a sand-cement slurry after review of their location and approval by the project geotechnical engineer and pipeline owner. Before construction, SES would submit an application to the DOGGR to conduct a Construction Site Review to identify and manage all active and abandoned petroleum production wells. Through the Construction Site Review process, the DOGGR assists in identifying and managing oil and gas wells located near or beneath proposed structures by specifying procedures for:

- locating wells, including records review and the use of test pits and magnetometer surveys, if necessary;
- surveying and identifying wells on site plans;
- testing of accessible, abandoned wells on the construction site for gas and oil leaks; and
- plugging and abandonment, or re-abandonment of wells, if necessary.

Upon completion of any required well work and the Construction Site Review process, the DOGGR would affix either a Division certification or review stamp to the construction plans and forward a copy of the approved plans to the local permitting agency to assist in the issuance of local construction permits.

SES would ensure that the construction contractor applies for the Construction Site Review and abides by the DOGGR's requirements. Implementation of these measures would reduce any potential impacts on oil production in the area associated with construction and operation of the proposed project to less than significant levels. Conversely, ongoing petroleum production would have no significant impact

on the operation of the LNG facility because ground subsidence due to petroleum production in the area has been, and will continue to be, controlled through water injection (see section 4.1.4.2).

4.1.4 Geologic Hazards

Geologic hazards present in the project area are related to seismic activity and historical subsidence associated with petroleum production in the area. Conditions or activities necessary for the development of other geologic hazards including karst terrain, avalanches, landslides, and volcanism are not present in the immediate project area.

4.1.4.1 Seismic Hazards

SES conducted site-specific geotechnical and geoseismic studies to evaluate the risk of seismic-induced damage to the proposed LNG terminal site (URS, 2003a, 2003b, 2004). These studies were conducted to meet the seismic design requirements of the OPS (Title 49 CFR Part 193), the FERC, and the POLB. The geotechnical and geoseismic studies were prepared in general conformance with *Data Requirements for the Seismic Review of LNG Facilities*, NBSIR 84-2833 and California Geological Survey Note 48, *Checklist for the Review of Geologic/Seismic Reports for California Public Schools, Hospitals, and Essential Services Buildings*. The studies contain the baseline data, assumptions, analysis, and rationale behind SES' proposed seismic control measures described in section 4.1.4.3. The geotechnical and geoseismic studies are available for viewing on the FERC Internet website and at the POLB offices in Long Beach.¹ The results of these studies are summarized in the following sections.

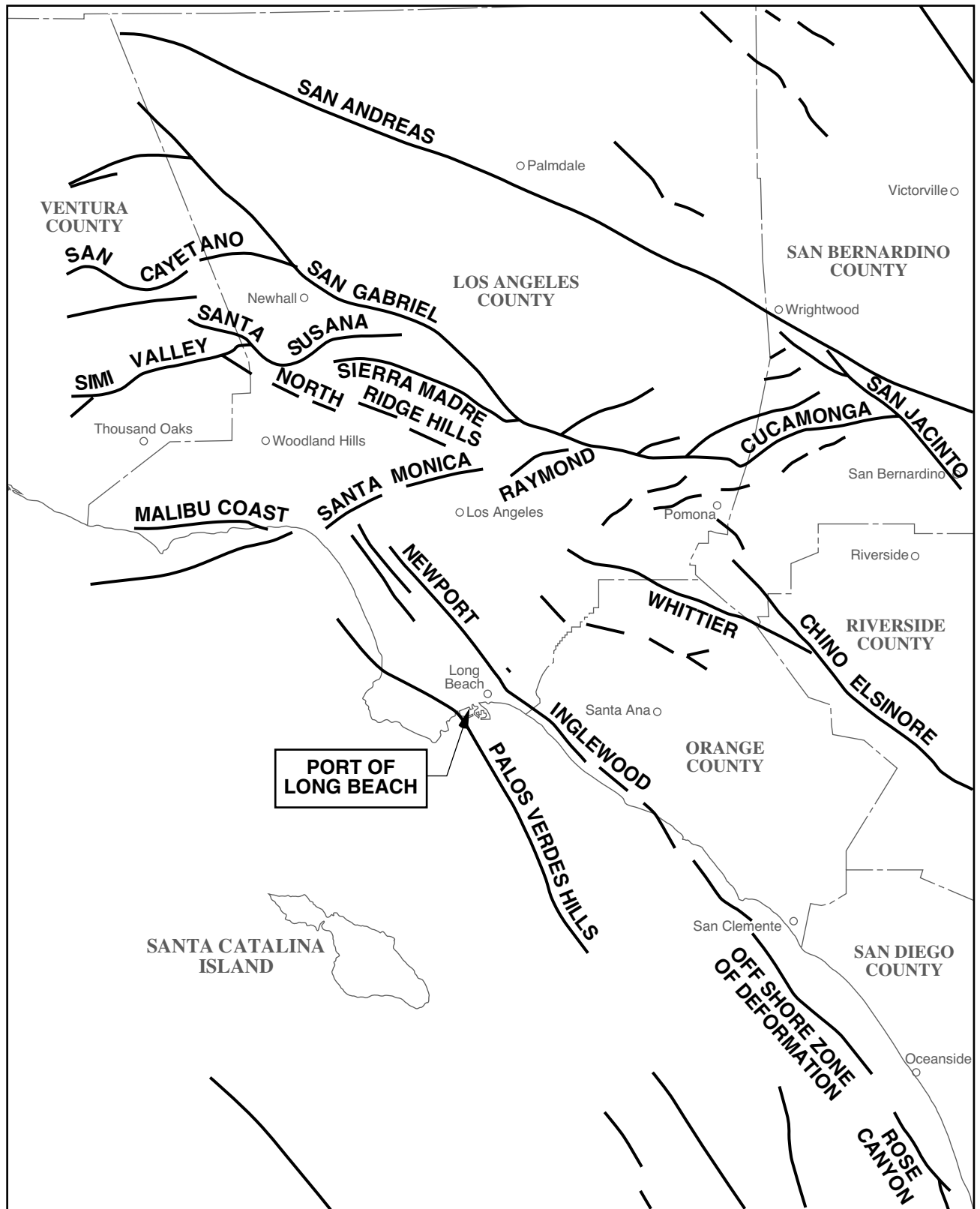
The Agency Staffs have reviewed SES' analysis of seismic hazards in the project area and its proposed design measures to mitigate seismic-induced damage to the LNG terminal. In conducting their review, the Agency Staffs were assisted by Dr. Felix Yokel, formerly of the National Institute of Standards and Technology.

In summary, the project is located in a region of high seismic activity due to its tectonic setting in the boundary between the North American and Pacific tectonic plates. Seismic-related hazards that could affect the project facilities include earthquakes; surface rupture; soil liquefaction, settlement, and lateral spreading; and tsunamis. These hazards are discussed in the following sections.

Earthquakes

In the project region, the high rate of relative motion between the North American and Pacific tectonic plates is largely accommodated along eight major fault zones. From west to east, these fault zones are the San Clemente, Santa Cruz-Santa Catalina Ridge, Palos Verdes (2.5 miles west of the LNG terminal site), Newport-Inglewood (4.3 miles east of the LNG terminal site), Elsinore, San Jacinto, San Andreas, and the eastern California shear zone (see figure 4.1.4-1). The Elsinore, San Jacinto, and San Andreas faults to the east of the project area are among the most active faults in California, and each has had moderate to large magnitude earthquakes with recurrence intervals on the order of several hundred years.

¹ URS, 2003a and 2003b are included as Appendices 6-1 and 6-2 of Resource Report 6 on the FERC Internet website (<http://www.ferc.gov>). URS, 2004 is on the website as a separate submittal. Using the "eLibrary" link, select "General Search" from the eLibrary menu and enter the docket number excluding the last three digits in the "Docket Number" field (i.e., CP04-58). Be sure to select an appropriate date range. Copies are also available for viewing at the POLB's offices at 925 Harbor Plaza, Long Beach, California.



SOURCE: Ninyo & Moore, 1995.

Figure 4.1.4-1
Long Beach LNG Import Project
Fault Location Map

Some of the larger historical earthquakes that have occurred within approximately 20 kilometers (13 miles) of the LNG terminal site include:

- The 1933 Long Beach earthquake, a moment magnitude (M_w) 6.4 event generated by the Newport-Inglewood fault. Although the epicenter of this earthquake was approximately 18 miles southeast of the LNG terminal site, the fault rupture proceeded northwest along the fault and into Long Beach, causing significant damage to buildings in downtown Long Beach and minor damage to facilities in the Port (which were then relatively undeveloped).
- Two local magnitude 4.8 earthquakes in 1941, also within the Newport-Inglewood fault zone, centered approximately 2.5 and 4.4 miles from the LNG terminal site.

Four additional earthquakes greater than the 1933 Long Beach earthquake have occurred within about 100 kilometers (63 miles) of the LNG terminal site as shown in table 4.1.4-1.

TABLE 4.1.4-1				
Earthquakes of Moment Magnitude Greater Than 6.5 Within 100 Kilometers (63 miles) of the LNG Terminal Site				
Date	Earthquake	Causative Fault	M_w	Epicentral Distance (miles)
December 8, 1812	Wrightwood	San Andreas	7.5 (estimated)	49 ^a
January 9, 1857	Fort Tejon	San Andreas	7.9 (estimated)	49 ^b
February 9, 1971	San Fernando	San Fernando	6.6	40
January 17, 1994	Northridge	Northridge blind thrust	6.7	37

^a The exact location of the 1812 earthquake on the San Andreas fault is uncertain, but there is evidence of surface rupture on both the Wrightwood and Mojave segments. The referenced distance is the closest distance of the Mojave segment to the LNG terminal site.

^b The referenced distance is the closest distance of surface rupture to the LNG terminal site; the epicentral distance was approximately 187 miles northwest of the site.

Ground motions associated with earthquakes are complex, but are often expressed in terms of how quickly the speed of the ground is changing or accelerating. Seismic hazard analysis also expresses earthquake-related motions in terms of the response spectra, or the approximate motions that would be experienced by a building. The greatest ground motion that has occurred at the proposed LNG terminal site during the past 150 years is estimated to have been associated with the 1933 Long Beach earthquake during which maximum or peak ground accelerations (PGA) of 20 percent gravity (0.20 g) horizontal component and 0.29 g vertical component were recorded at the nearby Long Beach Public Utilities Building. Before the 1933 earthquake, the greatest recorded ground motion at the proposed LNG terminal site was judged to be caused by the 1857 Fort Tejon M_w 7.9 earthquake, with an estimated median PGA of 0.09 g and an 84th percentile PGA of 0.14 g (URS, 2003b).

NFPA 59A Seismic Design Criteria – The OPS and the FERC require that seismic risk at proposed LNG terminals be assessed in accordance with NFPA 59A (2001). These requirements are discussed below. To satisfy these requirements, probabilistic seismic hazard analyses (PSHA) and deterministic seismic hazard analyses (DSHA) were conducted to quantify the magnitude and likelihood of certain ground motions that could occur at the LNG terminal site (URS, 2003b). In completing the seismic hazard assessment, Dr. Tom Rockwell of San Diego State University; Dr. John Shaw of Harvard University; and Michael Fisher, Daniel Ponti, and Brian Edwards of the USGS were consulted to obtain unpublished information and data on the potentially active faults in the project area, and to confirm that the most current data were used in the assessment.

The seismic hazard analysis included input data for 38 potential seismic sources in the region, including fault type, maximum anticipated magnitude, distance from the LNG terminal site, recurrence intervals, and consideration of local geology in modeling ground motion attenuation. The Palos Verdes fault/fault zone and the Newport-Inglewood fault/fault zone were found to be the main contributors to the potential ground motion hazard at the LNG terminal site because of their proximity and relatively high recurrence rates.

As required by NFPA 59A, the results of the seismic analysis were used to obtain PGA and response spectra for two design level earthquakes: the Operating Basis Earthquake (OBE) and the Safe Shutdown Earthquake (SSE). For the proposed LNG terminal site, the results of the PSHA governed the determination of the OBE and SSE motions. In general, the OBE represents the level of ground shaking through which a well-constructed facility should be able to operate and continue operating after its occurrence, with perhaps a brief shutdown for a safety inspection to confirm that no damage occurred. The results of the PSHA indicate that the mean recurrence interval of the OBE is 475 years. That is, the OBE represents the ground motions having a 10 percent probability of exceedance within a 50-year period.

The larger SSE event represents the level of ground shaking that should not damage the vital, safety-related components of a facility to the extent that they could not function. Such an event might, for example, crack walls, damage the control building, and warp pipelines requiring the facility to shut down for repairs, but it would not cause the LNG storage tanks to fail. The results of the PSHA indicate that the mean recurrence interval of the SSE is 4,975 years. That is, the SSE represents the ground motions having a 1 percent probability of occurrence within a 50-year period.

Detailed seismic design criteria for the proposed LNG terminal site were analyzed and the response spectra were determined for horizontal and vertical components of motion and damping ratios ranging from 0.5 percent to 20 percent. In general, the seismic hazard analysis indicates horizontal PGAs of 0.44 g for the OBE and 0.88 g for the SSE, with vertical components of motion approximately equal to two-thirds of the horizontal component. It is useful to note that the OBE would produce a horizontal PGA of approximately twice that of the 1933 earthquake that caused heavy damage in Long Beach; therefore, the 1933 event would not have caused any significant damage to the LNG terminal facilities.

POLB Seismic Design Criteria – The POLB considers two earthquake levels in the design of shoreline structures in its jurisdiction: the larger Contingency Level Earthquake (CLE) and the lesser Operating Level Earthquake (OLE). The CLE represents the level of ground shaking at which shoreline structures should not fail, whereas the OLE event represents the level of ground shaking after which these structures should remain functional. In terms of the ability of a facility to withstand an earthquake, the CLE could be viewed as roughly equivalent to the NFPA-defined SSE, and the OLE could be viewed as roughly equivalent to the NFPA-defined OBE. However, the POLB's CLE is probabilistically defined as an earthquake with a mean recurrence interval of 475 years, the same return period as the NFPA OBE.

To derive the ground motions associated with the CLE, the ground motions developed in accordance with NFPA 59A (2001) were further analyzed using more conservative procedures compatible with procedures used in other recent POLB projects (e.g., the adjacent Pier T Marine Terminal project and the Piers G and J Marine Terminal project in the Southeast Basin) (URS, 2004). Based on this analysis, the horizontal PGA for the CLE was determined to be 0.52 g, a more conservative result than the 0.44 g determined for the NFPA-design level earthquake with the same return period (the OBE). The ground motions predicted for the larger SSE event remained essentially unchanged at 0.88 g.

The relationship between the Richter magnitude and PGA is complex; therefore, it is not possible to assign a specific magnitude to the earthquake that would cause OBE- and SSE-level ground

movements. URS (2005) has suggested that the SSE equates to a Richter magnitude M7.9 on the Palos Verde and Newport-Inglewood faults, and a magnitude M6.6 earthquake on the THUMS-HB fault, but cautions that smaller earthquakes could cause equivalent ground movements. However, as indicated by the 4,975-year return period for the SSE, it is highly unlikely that earthquakes such as these would occur during the 50-year operating life of the facility.

The POLB asked SES to estimate how large an earthquake would be needed to cause the LNG storage tanks to fail. Analyses by ARUP (2005) and Mitsubishi Heavy Industries (2005) estimated that an earthquake of M9.0 on the Palos Verde fault or M7.5 on the THUMS-HB fault would be necessary to generate ground motions strong enough to rupture the tanks and release their contents. These events have estimated return intervals of approximately 15,000 years and, therefore, are extremely unlikely to occur during the 50-year life of the project. The potential impact of an earthquake-induced release from the LNG storage tanks is discussed in Appendix F.

In conclusion, the seismic design criteria developed in accordance with the POLB protocol have been used in the design of the LNG tanks and other critical structures at the proposed LNG terminal site, and are being utilized by the POLB in the final design of the shoreline structures. These seismic design criteria are more stringent than the criteria specified in NFPA 59A (2001) that are required by the OPS and the FERC.

Surface Rupture

The potential for surface fault rupture to occur in the project area was assessed in accordance with the *California Board for Geologists and Geophysicists Geologic Guidelines for Earthquake and/or Fault Hazard Reports*. Based on the available data, there is no potential for surface rupture to impact the project facilities. No active surface faults are known to occur within the LNG terminal site boundaries or along the proposed pipeline routes (Dibblee, 1989; Ziony and Jones, 1989; Jennings, 1994), and the project is not within an Alquist-Priolo Earthquake Fault Zone (see figure 4.1.4-1). California has established Alquist-Priolo Earthquake Fault Zones around faults considered to have been geologically active within the Holocene (11,000 years ago to today) and that have a sufficiently well-defined surface trace and a relatively high potential for surface rupture in the event of a large earthquake. The closest designated Alquist-Priolo Earthquake Fault Zone is the Newport-Inglewood fault zone, approximately 4 miles northeast of the LNG terminal site and 1 mile northeast of the closest point along the pipeline routes.

The Palos Verdes fault has been active during the Holocene. However, the main trace of this fault is approximately 2.5 miles southwest of the project facilities, and other active secondary traces are located southwest of the main trace. Consequently, the Palos Verdes fault is not considered to pose a potential surface rupture hazard to the facilities associated with the Long Beach LNG Import Project.

The subsurface trace of the THUMS-HB fault has probably been active during the Holocene, but several USGS high resolution stratigraphic and geophysical data sets from the Los Angeles and Long Beach harbor area clearly show that the THUMS-HB fault is deeply buried and does not actually displace Holocene or Pleistocene strata (URS, 2003b). These data are further supported by geotechnical boring data from the LNG terminal site, in conjunction with other published and unpublished stratigraphic data, which did not identify any evidence of near-surface rupture (URS, 2003b). Based on the available data, the THUMS-HB fault is not considered to pose a surface rupture hazard to the proposed project facilities.

Soil Liquefaction, Settlement, and Lateral Spreading

Secondary effects triggered by strong ground shaking are often more serious than the shaking itself. Soil liquefaction is a physical process in which saturated, cohesionless soils temporarily lose their strength when subjected to strong and prolonged shaking. Soil liquefaction can lead to various ground failures including settlement and lateral spreading.

The potential for soil liquefaction to occur at the LNG terminal site was evaluated consistent with the California Division of Mines and Geology's (DMG) *Recommended Procedures for Implementation of DMG Special Publication 117, Guidelines for Analyzing and Mitigating Liquefaction in California* (URS, 2003a). The assessment indicates that, without preventive measures, the upper 65 feet of loose to medium dense granular materials below the water table would liquefy if subjected to ground shaking from either the CLE or SSE, with maximum estimated post-earthquake settlements on the order of 19 to 25 inches, respectively. Even in the absence of seismic shaking, site soils are generally unsuitable for direct support of the proposed LNG storage tanks and other major structures, with the anticipated heavy loads causing settlements exceeding the specified settlement tolerances for the project (see section 4.2.2).

Existing shoreline structures at the LNG terminal site consist of a cellular steel sheet pile bulkhead along the south side of the site and a rock dike with a pile-supported concrete wharf along the west side of the site. Analysis by SES and the POLB suggests that the existing shoreline structures would suffer moderate to extensive structural damage and that lateral soil spreading primarily toward the shoreline structures would occur to varying degrees depending on the level of ground shaking at the site. In general, the lateral stability of site soils during seismic events would be achieved by strengthening the existing shoreline structures and improving the ground between the shoreline structures and the LNG storage tanks. The necessary reinforcement work would be the responsibility of the POLB. As discussed in section 2.3.1.2, the POLB is evaluating three different options for strengthening the shoreline structures to ensure that they would support the LNG tanks and other terminal structures if subjected to the ground shaking that could occur at the site.

Due to its ductility, welded steel pipe is able to withstand the effects of liquefaction. Therefore, loss of load-bearing strength due to liquefaction along the proposed pipeline routes is not considered to pose a significant hazard to the pipelines.

Tsunamis

Tsunamis are long-period oceanic waves generally caused by seismic activity. The magnitude of the potential hazard is a function of the coastline configuration, sea floor topography, individual wave characteristics, magnitude of the initiating event, and distance and direction from the source.

The largest recorded tsunami in the Long Beach or Los Angeles harbor areas had a run-up height in the 5-foot range. This tsunami was the result of the 1960 Chile earthquake of M_w 9.5, the largest earthquake ever recorded. Smaller tsunamis were also recorded in the area from 1812 to 1975 (McCulloch, 1985).

Various estimates of tsunami run-up heights, primarily from distant sources, have been developed for the project area. Synolakis (2003) estimated a 100-year run-up height of 8 feet and a 500-year run-up height of 15 feet for the POLB area. More recently, Borrero et al. (2005) estimated that a tsunami of approximately 13 feet could occur near the LNG terminal site as the result of a large, submarine landslide located 10 miles southwest of the LNG terminal site.

The highest reported tide in Long Beach Harbor was +7.54 feet MLLW and the mean high water level (the average of all high tides) is +4.71 feet MLLW. The base elevation of the LNG terminal would be +20 feet MLLW and the elevation at the top of the security barrier wall surrounding the LNG tanks would be approximately +40 feet MLLW. Based on these elevations, the LNG terminal site would not be flooded by the 100-year tsunami described by Synolakis (2003), even if it were to occur in conjunction with the highest recorded tide for Long Beach Harbor. The LNG terminal site also would not be flooded by the 500-year tsunami described by Synolakis (2003) or by the locally sourced tsunami described by Borrero, et. al., (2005), even if these events occurred in conjunction with the mean high tide. The LNG terminal site could experience 2.5 feet of flooding if the 500-year tsunami were to occur in conjunction with the highest tide recorded in Long Beach Harbor; however, the security barrier wall would prevent the LNG tanks from being flooded.

The potential damage that a tsunami could cause while an LNG ship is at berth would depend on the height of the tsunami and tide. The shoreline structures and unloading equipment are designed to operate within a range of motion that includes the 8-foot extreme tidal range in Long Beach Harbor plus the LNG vessel's change in draft of some 30 feet as a result of unloading. Therefore, a smaller moderate tsunami occurring at low tide would have little effect on an LNG ship at berth. In the case of the 500-year (15-foot) tsunami, serious damage to a ship could only occur if the ship happened to be at berth when the tsunami arrived and the motion of the ship caused enough mooring lines to break to allow the ship to be thrown against the wharf. Alternatively, a vessel that happened to be transiting in the West Basin could be thrown against the LNG vessel at berth. The LNG marine transport safety record suggests that the risk of a significant LNG spill due to such collisions is low. Since 1959, two collisions of LNG ships with fixed objects and eight collisions with other ships have occurred in or near ports. None of these incidents resulted in any release of cargo [Quest Consultants, Inc. (Quest), 2005]. A detailed discussion of LNG ship standards and design features is presented in section 2.1.2. The safety record of LNG shipping is discussed in section 4.11.7.3.

The December 24, 2004 Sumatra M_w 9.3 earthquake generated a devastating tsunami that claimed hundreds of thousands of lives and caused damage and destruction in many coastal areas bordering the Indian Ocean. The EIA (2005) reported that the largest energy facility in the area affected by the tsunami, Indonesia's PT Arun LNG facility in Banda Aceh, Sumatra, was not damaged by the tsunami. The maximum runup height observed at Banda Aceh was approximately 30 feet. At an oil transfer facility approximately 30 miles to the east of Banda Aceh, the bulk oil storage tanks remained in good condition after the tsunami, although one tank was moved off its foundation by the force of the 16-foot waves. A tanker was unloading oil at the time the tsunami struck, but the crew apparently managed to control the ship and move it offshore. EIA (2005) also notes that Australia's North West Shelf project reported only a minor delay in the loading of an LNG tanker.

Due to the low likelihood of a significant tsunami occurring during the operating life of the LNG terminal (especially in conjunction with a high tide), the ability of the berthing structure and unloading equipment to operate within a range of water levels, and the construction of the LNG ships and engineered safety controls on the unloading equipment, the potential tsunami hazard at the LNG terminal site and along the pipeline routes is very low.

Based on the Intergovernmental Panel on Climate Change (2001), the global sea level rise is expected to be 2 to 4 inches over an assumed 50-year operating life of the project. This amount would not be significant in the context of daily tidal changes and would not affect the tsunami hazard analysis for the project.

4.1.4.2 Subsidence

Extraction of hydrocarbons from the Wilmington Anticline has resulted in subsidence of the overlying land surface in the area. Minor amounts of regional subsidence, related to groundwater extraction and possibly natural basin-sediment consolidation, were also noted as early as 1928. Between 1929 and 1967, approximately 29 feet of total subsidence was recorded over the eastern end of Terminal Island, near the project's proposed HDD entry points on the south side of the Cerritos Channel. The LNG terminal site has experienced historical subsidence of approximately 8 to 14 feet and approximately 10 to 29 feet of total subsidence has occurred along the proposed pipeline routes.

Beginning in the 1950s, millions of tons of land-based and dredged materials were placed in the subsided areas and secondary injection of water into the oil-depleted zones was initiated to reduce the rate of subsidence. Subsidence was largely arrested by the 1970s, and some areas have since experienced slight rebound. Water for secondary injection is obtained from local groundwater resources. One of the water injection wells, located approximately 75 feet to the east of the proposed LNG terminal site, pumps water from a depth of approximately 90 feet for injection into oil-producing zones at depths of typically more than 1,000 feet (URS, 2003b).

As discussed in section 4.1.3.1, there is current oil production in the project area. The balance of oil production and water injection is monitored by the City of Long Beach, Department of Oil Properties (DOP), which is charged with bi-annual surveys to measure and record subsidence and/or rebound in the area. In its report *Elevation Changes in the City of Long Beach, November 2001 to January 2003*, the DOP states that less than 0.05 feet of subsidence occurred over all of Pier T during the reporting period. As mandated by the 1958 California Subsidence Act, oil receipts fund the land surveys and water injection wells, thereby ensuring future subsidence control.

4.1.4.3 Impact and Mitigation

Seismic Hazards

Seismic activity could potentially damage the LNG terminal site facilities, shoreline structures, and pipeline and electric distribution facilities through strong shaking or secondary ground deformation such as liquefaction, shaking-induced settlement, or lateral spreading. As discussed in section 4.1.4.1, the potential for tsunamis or surface rupture to affect the project facilities is very low and, therefore, no specific mitigation is proposed.

The seismic risk to the facility is attributable to ground motions induced by earthquakes. The project facilities would be designed to meet or exceed the seismic design criteria of NFPA 59A and the more stringent criteria of the POLB. The facilities would also comply with the seismic design provisions of the California Building Code, of which some of the more notable requirements include design procedures for seismic isolation systems and additional requirements for liquefaction mitigation foundations and superstructure-to-foundation connections. By complying with these applicable codes and design criteria, the facility could operate after all but the most extreme earthquake scenarios. Even in the unlikely event of the SSE level earthquake (with a return period of 4,975 years), the vital, safety-related components of the facility would function. Five foundation options to avoid liquefaction-related damage and to meet the stringent static settlement criteria for the LNG storage tank and other major structures were evaluated (URS, 2003a, 2004). In general, SES plans to construct the LNG storage tanks and other heavy load and critical structures on driven pile foundations, subject to final geotechnical assessment and final engineering designs. The current design calls for either concrete or tubular steel piles to be driven to depths of approximately 90 to 120 feet into the competent marine sand unit that exists beneath the shallower fill and fine-grained estuarine deposits at the site. The upper 5 to 15 feet of fill and soil may

also be removed from beneath the LNG tanks and replaced with engineered fill to increase lateral pile stability. A reinforced concrete base slab foundation would be constructed on the piles on which the LNG storage tanks would be built with seismic isolators or a flexible foundation to reduce horizontal seismic load.

The POLB has assessed the existing shoreline structures and is evaluating three options to strengthen the shoreline and related structures as needed to support the upland loads generated by the LNG storage tanks, other heavy load structures, and loads imposed by seismic events. The options vary in the degree to which the west wharf structure would be repaired or replaced, but all of the alternatives would include construction of in-water rock buttresses along the western and southern berth frontages, and the installation of approximately 3,380 stone columns between the shoreline structures and the security barrier wall. An additional approximately 2,000 stone columns would be installed between the security barrier wall and the LNG storage tanks. These remedial actions would be designed to provide ample static support to the LNG terminal structures and to limit the horizontal displacement of the shoreline structures to acceptable limits during predicted levels of earthquake-induced shaking.

Due to their linear extent and ductility, the proposed pipelines would be less susceptible to damage from strong shaking and liquefaction. If seismic-induced liquefaction were to occur along the pipeline routes, the pipelines could float up to just below the ground surface. This could require their reburial, but would not cause a rupture and, therefore, would not be a catastrophic event. The pipelines would be constructed, maintained, and operated in accordance with all applicable federal, state, and local regulations, which would further reduce the potential effects of seismic activity. Seismic activity is not expected to adversely affect the electric distribution facilities.

The potential impact of seismic-related damage on the project facilities would be further reduced by active and passive fail-safe design in loading equipment, process equipment, piping, and controls; operator training; and emergency response planning (see section 2.7).

In conclusion, a detailed analysis prepared by SES in support of its application resulted in seismic design criteria that meet the POLB requirements and exceed the OPS and the FERC requirements as specified in NFPA 59A (2001). The Agency Staffs reviewed the current engineering designs for the LNG storage tanks and other critical terminal structures. These designs are of sufficient detail to demonstrate that the project facilities would withstand the seismic hazards that could affect the site when they are constructed to the specifications of the plans. To ensure that final engineering designs meet or exceed applicable seismic standards, SES would provide the final plans to the FERC and the POLB for review and approval before construction. The POLB would construct the shoreline structures to meet the stringent seismic design criteria developed for the site, and stone columns would be installed between the shoreline structures and the LNG storage tanks thereby providing the required lateral support to limit displacement and minimize stress and strain levels well within the design limits of the LNG storage tanks and other heavy load structures in the event of an earthquake. Implementation of approved final designs for the LNG tanks, shoreline structures, and other critical structures at the LNG terminal would reduce the potential effects of seismic hazards to less than significant levels.

Subsidence

Regional subsidence due to ongoing hydrocarbon production is already effectively monitored and controlled and, therefore, would not affect construction or operation of the project. Underground piping associated with the water injection system could potentially be encountered during project construction. SES would identify all underground piping in the construction area and would either move or protect the piping during construction by exercising due care and standard construction methods. Any damage to underground water piping would be repaired immediately. Implementation of these measures and the

continued operation of the ongoing subsidence control program would reduce potential impacts associated with subsidence to less than significant levels.

4.1.5 Paleontological Resources

The majority of the project would be constructed in a previously developed portion of the Port that is largely underlain by deep, man-placed fill materials, with unconsolidated fluvial and alluvial deposits beneath the northern extent of the pipelines. Therefore, no undisturbed fossils are present near the ground surface in the project vicinity and fossil-bearing rock units would not be encountered during construction of the proposed facilities, including excavation for the pipelines. The Long Beach LNG Import Project would have no impact on paleontological resources.

4.2 SOILS AND SEDIMENTS

4.2.1 Significance Criteria

Impacts on soils and sediments would be considered significant if project construction or operation would:

- increase erosion rates or reduce soil productivity by compaction or soil mixing to a level that would prevent successful rehabilitation and eventual reestablishment of vegetative cover to the recommended or preconstruction composition and density; or
- increase exposure of human or ecological receptors to potentially hazardous levels of chemicals or explosives due to the disturbance of contaminated soils or sediments, or due to the discharge or disposal of clean material into soils or sediments containing hazardous materials.

4.2.2 Soil Resources

4.2.2.1 Environmental Setting

As discussed in section 4.1.2.1, the facilities associated with the Long Beach LNG Import Project would be primarily located within a highly developed portion of the POLB. The LNG terminal site and proposed pipeline routes from MPs 0.0 to 1.4 are underlain by deep fill materials. Surficial deposits from MPs 1.4 to 3.8 of the pipeline routes consist of soft clay, silt, silty sand, and sand of distal fan deposits associated with the active Los Angeles River system. Older alluvial deposits, generally comprising dense to very dense sand and silty sand, are present at the surface from MPs 3.8 to 4.6 of the C₂ pipeline route. There are no hydric soils or prime farmland soils on the LNG terminal site or along the route of the proposed pipeline and electric distribution facilities. Much of the project area is currently covered by asphalt or concrete and does not support vegetation. The temporary construction laydown and worker parking area is graveled. Vegetation in the area is limited to common weed species (see section 4.4.2).

Soil Limitations

Based on site-specific exploratory drilling, cone penetration tests, seismic velocity surveys, and geotechnical laboratory testing, it was determined that fill materials at the LNG terminal site would not provide adequate support to meet the stringent static settlement criteria for the LNG storage tanks or other heavy load structures (URS, 2003a). It is estimated that total static settlement of the LNG storage tanks, if founded on existing fill materials, would be about 3 feet near the perimeter of the tanks and about 5 feet near the center of the tanks. The resulting differential settlement of about 2 feet far exceeds the 5-inch settlement tolerance criterion for the LNG storage tanks.

Fill materials and native soils along the route of the proposed pipeline and electric distribution facilities are expected to provide adequate static support to these facilities.

Potentially Contaminated Soils

No indications of potential soil contamination were observed in the field during the geotechnical exploration of the LNG terminal site, and no petroleum contamination was detected by laboratory analysis in a sample of the drill cuttings derived from the geotechnical soil borings (URS, 2003a). However, due to historic petroleum production, other industrial activity, and former naval operations at the LNG terminal site, the potential exists for contaminated soils to be at the site.

According to the POLB, petroleum-impacted soil could be encountered at any location on Pier T (Houston, 2003). Specific areas of previously documented soil contamination in the area include IR Sites 11, 12, and 13, which were identified by the Navy during closure of its Long Beach Complex. IR Sites 11 and 12 are located just to the north of the LNG terminal site and would be crossed by the pipelines. IR Site 13 is partially located beneath the northeast portion of the LNG terminal site. After investigating these areas, the Navy recommended no further action for contaminated soils in IR Sites 11 and 13 (Department of the Navy/City of Long Beach, 1998). The Navy is preparing a proposed plan for the IR sites that would recommend restricting future use of these sites to commercial or industrial uses only. No active remediation is planned; however, if the POLB or its tenants excavate hazardous substances, the excavated materials would need to be disposed of properly after appropriate notification to the DTSC and coordination with the Navy and the Base Reuse and Closure regulators. The Navy also removed an underground storage tank from the southwest corner of the LNG terminal site. According to the POLB, the Navy cleaned up the site to levels that protect the health of site workers and the environment (Houston, 2003).

A search of available environmental records was also conducted to identify known and potential hazardous waste sites in the vicinity of the proposed project facilities (see section 4.5.4). Because of the activities described above, the former Long Beach Naval Shipyard and Station is listed as a hazardous waste site. Several hazardous waste sites have been identified within 0.25 mile of the pipeline routes and electric distribution facilities; however, none of these sites would be crossed by the proposed facilities (see table 4.5.4-1).

Ordnance

The Navy reported that no evidence was found to indicate that ordnance or munitions were ever handled at the former Long Beach Complex (Department of the Navy/City of Long Beach, 1998). No ordnance has been discovered on the proposed site, nor has ordnance been discovered on any other upland areas of the naval complex during their redevelopment. However, some ordnance has been discovered in the West Basin during dredging (see section 4.2.3.2).

4.2.2.2 Impact and Mitigation

Because of the highly developed, industrial nature of the area and the presence of mostly fill materials under the majority of the project facilities, the project would not reduce soil productivity by compaction or soil mixing; reestablishment of vegetative cover is not an objective of the project given its industrial nature. However, construction of the project facilities would temporarily expose the fill materials on the affected portion of Terminal Island and the native soils at the end of the pipeline routes to the effects of wind, rain, and runoff, which could cause erosion and sedimentation in the area. Erosion control measures proposed for the Long Beach LNG Import Project are detailed in SES' Sediment Control Plan that is included in its SWPPP (see Appendix B). A detailed discussion of the SWPPP is presented in section 4.3.3.2. Some of the pertinent measures in the Sediment Control Plan include:

- assignment of an EI to oversee and ensure compliance with the SWPPP, the Sediment Control Plan, and applicable permit requirements;
- specific planning and construction procedures such as the use of temporary silt fences around work areas, control of sediment tracking onto area streets, and phased grading schedules that would limit ground disturbance and prevent sediments from leaving the construction work area and entering the harbor;

- post-construction cleanup of all construction debris unless the POLB approves otherwise; and
- post-construction monitoring and limited regrading to correct any drainage problems resulting from construction activities.

Following construction, the site would be final graded and cleaned up. Some areas would be seeded and mulched; the remainder would be covered with gravel, asphalt, and concrete. Implementation of the measures in SES' Sediment Control Plan would reduce erosion impacts to less than significant levels.

Existing soils at the LNG terminal site are not capable of adequately supporting the LNG storage tanks or other heavy load structures. As a result, SES proposes to install deep-driven pile foundations beneath the LNG storage tanks and other heavy load structures to meet the stringent static-settlement criteria for the structures at the LNG terminal (see section 4.1.4). As described in section 4.1.4.3, installation of the piles may include the replacement of 5 to 15 feet of existing fill material beneath the LNG tanks with engineered fill that would be obtained from a licensed facility. Excavating 15 feet of material from beneath both tanks would generate approximately 90,000 cubic yards of soil. Other soil improvements at the site would include the installation of approximately 3,380 stone columns to depths of 60 to 80 feet bgs between the shoreline structures and the security barrier wall and an additional approximately 2,000 stone columns to a depth of 60 feet bgs between the security barrier wall and the LNG storage tanks. The installation of the stone columns would generate approximately 86,500 cubic yards of soil. If the excavated fill and soil derived from installation of the stone columns are determined to be clean, they would be re-used at an approved location, most likely within the POLB. Procedures for handling and disposal of contaminated materials are discussed below. Implementation of approved designs for soil improvements would mitigate the impacts associated with geotechnical soil limitations at the LNG terminal site to less than significant levels.

In addition to excavation for the soil improvements, construction of the project would involve excavation for the LNG spill impoundment systems and other utilities and foundations at the LNG terminal site, and trenching for the pipeline and electric distribution facilities. Contaminated soil and other hazardous materials could be encountered during any of these activities. If hazardous substances are encountered during construction, SES would notify the POLB. SES, in consultation with the POLB, would comply with all applicable environmental regulations. Before construction, SES and the pipeline contractor(s) would submit work plans that outline appropriate environmental site investigation and remediation activities to the appropriate agencies for approval. The work plans would include a site-specific Health and Safety Plan, Sampling and Analysis Plan, Project Contractor Quality Control Plan, and an Environmental Protection Plan that would also include a Waste Management Plan. The Environmental Protection Plan would identify the applicable regulatory oversight agencies and their permit authorities. The Health and Safety Plan would address potential contaminant exposure concerns applicable to site workers and the adjacent environment. The Health and Safety Plan would include the following measures:

- Workers would stop activities and leave the contaminated area immediately.
- The Chief Inspector would be notified of the contamination. The Chief Inspector would ensure that the area is secured to keep workers clear. Once the area is secure, the Chief Inspector would notify construction management personnel and the SES-designated Environmental/Safety Coordinator.

- The Environmental/Safety Coordinator would make the applicable agency notifications and obtain the necessary regulatory approvals and permits. The Environmental/Safety Coordinator would work with the SES Environmental Compliance Department (ECD) to determine the type(s) of contaminants present, including arranging for a hazardous waste contractor to sample the affected material as necessary. Once the contaminants have been identified, the Environmental/Safety Coordinator would coordinate the proper disposal of the material with the ECD as described in SES' Spill Procedure included in its SWPPP (see Appendix B).
- The Environmental/Safety Coordinator would communicate safety concerns to the Chief Inspector and construction management personnel and would ensure that the Chief Inspector informs contractors, inspectors, and other personnel of any hazard and the appropriate worker safety requirements.
- Construction management personnel would coordinate the activities of all parties to rectify the situation safely and in compliance with all applicable regulations.

Implementation of these measures would reduce impacts associated with a discovery of contaminated soils or other hazardous materials to less than significant levels.

Spills or leaks of fuels, lubricants, or other hazardous substances during construction and/or operation of the project could also have an impact on soils. This potential impact is expected to be minor, however, because of the typically low frequency, volume, and extent of spills or leaks, and because of the hazard detection system and other safety controls designed to prevent or contain spills and leaks at the LNG terminal site (see section 2.7). Implementation of SES' Spill Procedure included in its SWPPP would further reduce the likelihood of a significant spill or leak occurring during construction or operation of the project, and would reduce the impact of any spill or leak that may occur. As a result, impacts on soils associated with a hazardous spill or leak would be less than significant. A detailed discussion of the measures included in SES' Spill Procedure is presented in section 4.3.2.2.

4.2.3 Sediments

4.2.3.1 Environmental Setting

Up to approximately 175,000 cubic yards of sediments would be dredged from the West Basin of Long Beach Middle Harbor to accommodate the LNG ships. An additional 100,000 to 300,000 cubic yards of sediments would be dredged to install the rock buttresses necessary to reinforce the shoreline structures. The only other waterbodies that could be impacted by the project are the Cerritos and Dominguez Channels. As discussed in section 4.3.3.2, SES would install the natural gas and C₂ pipelines beneath the Cerritos Channel using the HDD method, which involves installing the pipe by drilling from bank to bank at depths ranging from 33 to 50 feet below the deepest part of the channel. The C₂ pipeline would be installed across the Dominguez Channel on existing pipe racks. Therefore, sediments within the Cerritos and Dominguez Channels would not be affected by the project.

The Navy and the POLB have conducted physical and chemical analysis of the sediments in the West Basin. In general, these studies found that the West Basin sediments consist of sand, fine silts, and clays. Metals, pesticides, polychlorinated biphenyls (PCBs), volatile organic compounds (VOC), and semi-VOC were documented in sediments throughout the West Basin, but at generally higher concentrations under piers and near sea walls than in open waters (Department of the Navy/City of Long Beach, 1998). The occurrence and distribution of contaminated sediments is not unexpected considering

the harbor's exposure to industrial and urban discharges and runoff and its somewhat restricted circulation (see section 4.3.3).

Two of the Navy's previous sediment sampling locations, Stations 27 and 28, are located on or near the footprint of the proposed ship berth and unloading facility. Contaminants were detected in sediments at both sites; the sediment contaminant levels were higher at Station 27. At Station 27, contaminants were found to exceed the Effects Range Low (ERL) and Effects Range Medium (ERM) for several metals. Copper was found approaching the ERM [220 milligrams per kilogram (mg/kg)] and levels of mercury (0.87 mg/kg), PCBs [430 micrograms per kilogram (µg/kg)], and total dichlorodiphenyltrichloroethane (DDTs) (112 µg/kg) were over the ERM (Department of the Navy/City of Long Beach, 1998).

The POLB (1998) obtained samples for physical and chemical analysis from 14 locations near the proposed ship berth and unloading facility. Four of the POLB sample sites were located along and approximately 25 feet from the existing wharf along the west side of Pier T. In these four samples, the maximum concentration of polynuclear aromatic hydrocarbons that exceeded their ERLs were: acenaphthylene (65 µg/kg), acenaphthene (46 µg/kg), fluorene (51 µg/kg), anthracene (369 µg/kg), fluoranthene (760 µg/kg), pyrene (1,010 µg/kg), benzo (a) anthracene (367 µg/kg), and chrysene (665 µg/kg). Arsenic (10 mg/kg), lead (93 mg/kg), nickel (26 mg/kg), and zinc (290 mg/kg) exceeded their ERL, and copper (295 mg/kg) and mercury (2.7 mg/kg) exceeded their ERM. One pesticide, dichlorodiphenyldichloroethylene (DDE), was found at a maximum concentration of 19.3 µg/kg, and total PCBs was at a maximum concentration of 205 µg/kg, exceeding their respective ERMs.

Although the Navy reported that no evidence was found to indicate that ordnance or munitions were ever handled at the former Long Beach Complex (Department of the Navy/City of Long Beach, 1998), recent dredging activities in the West Basin encountered ordnance.

4.2.3.2 Impact and Mitigation

The estimated duration of dredging and the placement of the rock buttresses to reinforce the shoreline structures is 8 to 10 months, and would be concurrent with other in-water construction. Disturbance of the West Basin sediments during in-water activities would temporarily resuspend sediments in the water column, which could cause turbidity. An increase in sediment and turbidity levels could adversely affect water quality and aquatic organisms. Resuspension of contaminated sediments could also impact marine organisms in the area. The POLB has recently negotiated a consent agreement with the DTSC for its concurrence with the IR Site 7 (West Basin) sediment remediation. Accordingly, the dredging associated with the project would be done only with the concurrence of the DTSC. Refer to sections 4.3.3 and 4.4.3, respectively, for a discussion of the potential impact of in-water activities on water quality and aquatic organisms and measures to avoid or reduce any potential adverse impacts associated with these activities to less than significant levels.

Disturbance of the West Basin sediments could also encounter ordnance. Any ordnance found during dredging for the proposed project would be handled in accordance with federal regulations and the POLB's procedures. In general, the POLB's procedures require that the dredging contractor stop work immediately and contact the project engineer when ordnance is found. The project engineer then contacts the Navy Explosive Ordnance Disposal office, which provides preliminary instructions to ensure the safety of the dredge crew, including possibly leaving the vessel. The Navy Explosive Ordnance Disposal office then dispatches staff to the site to pick up the ordnance. Adherence to these regulations and procedures would reduce the impact of a discovery of ordnance to less than significant levels.

4.3 WATER RESOURCES

4.3.1 Significance Criteria

Impacts on groundwater would be considered significant if project construction or operation would:

- alter the flow of groundwater to local springs or wetland areas;
- interrupt, deplete, or degrade groundwater used for private or municipal purposes; or
- result in either short-term or long-term violation of federal or state agency numerical water quality standards.

Impacts on surface waters would be considered significant if project construction or operation would:

- result in long-term detrimental alteration of harbor circulation;
- substantially degrade water quality; or
- alter channel bed armoring so it results in short- or long-term erosion.

4.3.2 Groundwater Resources

4.3.2.1 Environmental Setting

Groundwater

The West Coast sub-basin of the Los Angeles County Groundwater Basin (West Coast Basin), which is a part of the Los Angeles - Orange County Coastal Plain Aquifer System, underlies the Long Beach LNG Import Project facilities. The Coastal Plain Aquifer System extends approximately 860 square miles and consists of as many as 11 locally named aquifers, each of which consists of a distinct layer of water-bearing sand and gravel usually separated from other aquifers by clay and silt confining units. The West Coast Basin extends over 142 square miles. In descending order, the primary named aquifers that underlie the project area consist of a shallow, semi-perched unit; the Gaspar Aquifer; the Gage Aquifer; the Lynnwood Aquifer; and the Silverado Aquifer.

Semi-perched Unit – At the LNG terminal site, the shallow, semi-perched unit occurs within fill materials that extend to depths of 45 to 60 feet bgs. The semi-perched unit occurs at a depth of approximately 20 to 25 feet at the LNG terminal site and is saline in the project area due to interaction with marine waters; it is not recognized as a water-producing zone (Department of the Navy/City of Long Beach, 1998). Shallow groundwater contamination from historical Navy operations was documented at IR Site 13, located on and adjacent to the northeast corner of the LNG terminal site. Other localized sources of groundwater contamination may also be present in the area (Houston, 2003). The semi-perched unit is separated from the deeper Gaspar Aquifer by 20 to 35 feet of silt and clay estuarine deposits, which may act as a barrier to contamination transport between the shallow groundwater unit and the Gaspar Aquifer (Department of the Navy/City of Long Beach, 1998).

Gaspar Aquifer – In the project area, the Gaspar Aquifer occurs in marine sands or in onshore equivalent sand and gravel deposits at depths of 60 to 150 feet bgs (URS, 2003b). Water quality in the Gaspar Aquifer has not been tested in the immediate project area, but nearshore fresh water resources, including those in the project area, have been affected by salt water intrusion since the 1950s. Localized

areas of benzene contamination are also known to exist in the Gaspar Aquifer under the POLB (Houston, 2003). The Gaspar Aquifer is not a source of drinking water in the area, but it is used as a source of water for secondary injection into oil-producing zones at depths of more than 4,000 feet.

Gage, Lynnwood, and Silverado Aquifers – The Gage, Lynnwood, and Silverado Aquifers occur in interbedded sand, sand, and gravel units at depths ranging from approximately 150 to 1,100 feet bgs in the project area (URS, 2003b). Fresh water resources in the project area have been impacted by salt water intrusion. Further landward intrusion of salt water has been limited by a series of fresh water injection barriers and, where not impacted by salt water, the West Coast Basin aquifers are an important source of drinking water.

Sole Source Aquifers

There are no EPA-designated sole source aquifers in the project area (EPA, 2004). The State of California instituted the California Drinking Water Source Assessment and Protection (DWSAP) Program in response to the 1996 Federal Safe Drinking Water Act. As of April 2005, the state had not designated any protected aquifers or wellhead protection areas in the West Coast Basin (DWSAP, 2005).

Wells and Springs

There are no public or private drinking water wells within the LNG terminal site or the temporary construction laydown and worker parking area, nor are there any drinking water wells within 150 feet of the proposed pipeline or electric distribution facilities. Drinking water is supplied to the LNG terminal site through the POLB from the City of Long Beach Water Department. In turn, the City of Long Beach obtains its water from the Metropolitan Water District (about 56 percent) and from West Coast Basin groundwater resources (about 44 percent).

An active groundwater well is located approximately 75 feet east of the LNG terminal site. This well produces water from the Gaspar Aquifer at a depth of approximately 90 feet for secondary injection into deeper oil-producing zones to control subsidence in the area. Additional information regarding subsidence control in the area is presented in section 4.1.4.2.

No springs were identified within 150 feet of the LNG terminal site, temporary construction laydown and worker parking area, pipeline facilities, or electric distribution facilities.

4.3.2.2 Impact and Mitigation

Construction

Activities associated with construction of the proposed project facilities, including hydrostatic test water appropriation, the installation of deep-driven pile foundations and stone columns at the LNG terminal site, the HDDs of the Cerritos Channel, site excavation and dewatering, and accidental spills or leaks of hazardous materials could adversely affect groundwater quality within the project area as described below.

Hydrostatic Test Water Appropriation – Hydrostatic testing activities associated with the LNG storage tanks and natural gas and C₂ pipelines would make a one-time, temporary demand on the POLB and City of Long Beach municipal water system. Approximately 24 million gallons of water appropriated from the municipal system would be used to hydrostatically test the LNG storage tanks, about 642,000 gallons would be used to test the natural gas pipeline, and about 84,300 gallons would be used to test the C₂ pipeline.

SES would negotiate project water requirements with the City of Long Beach for appropriate fees and would ensure that the project would have no impact on water availability in the area. According to the City of Long Beach Water Department (2005), the volume of water needed to test the LNG storage tanks and pipelines does not represent a large volume to the municipal system, and no specific mitigation measures would be required. No chemicals or additives would be added to the test water and the water would be sampled before use and before discharge into the POLB storm water drainage system. Therefore, the impacts associated with hydrostatic test water appropriation would be less than significant. The impacts associated with discharge of the hydrostatic test water are discussed in section 4.3.3.2.

Installation of Deep-driven Pile Foundations – The foundation piles that SES proposes to install at the LNG terminal site are presently planned for depths of 90 to 120 feet bgs and would extend into the Gaspar Aquifer. The piles would be driven rather than excavated, which would prevent the creation of an opening for potential cross-contamination from the shallow, semi-perched unit to the deeper Gaspar Aquifer. As a result, there would be no significant impact on groundwater resources associated with the foundation piles.

Installation of Stone Columns – The stone columns that would be installed to improve soils between the shoreline structures and the LNG storage tanks would be drilled to depths of 60 to 80 feet bgs and would extend into the top of the Gaspar Aquifer. The stone columns would essentially replace finer-grained fill and estuarine deposits with coarse gravel, potentially creating a preferential pathway for cross-contamination to occur. However, in constructing the stone columns, a plug would be formed by adding cement to the gravel from the base of each column to at least 10 feet above the top of the Gaspar Aquifer, thereby preventing cross-contamination from the shallow, semi-perched unit to the Gaspar Aquifer. As a result, there would be no significant impact on groundwater resources associated with the stone columns.

HDDs of the Cerritos Channel – The Gaspar Aquifer could potentially be penetrated during installation of the natural gas and C₂ pipelines beneath the Cerritos Channel using the HDD construction method. To minimize potential impacts on local aquifers during HDD activities, SES would implement the following control measures identified in its HDD Plan (see Appendix C):

- The HDD activities would be continuously monitored by experienced personnel to minimize the potential for an inadvertent release of drilling fluid.
- The drilling fluid would not contain any toxic or hazardous materials.
- The specific weight of the drilling fluid would be closely monitored and adjusted to maintain hydraulic stability of the bore hole.
- In the event of a release of drilling fluid, drilling pressure would be reduced and operations would be suspended to assess the extent of the release and to implement other possible corrective actions.

Implementation of the HDD Plan would reduce potential impacts of the HDD crossings on local aquifers to less than significant levels. Additional information on the HDD crossings of the Cerritos Channel is presented in section 4.3.3.2.

Site Excavation and Dewatering – Underground piping associated with the water injection system could potentially be encountered during excavation. SES would identify all underground piping in the construction area and would either move or protect the piping during construction by exercising due care

and standard construction methods. Any damage to underground water piping would be repaired immediately. Therefore, construction of the project would not impact the subsidence control system.

Construction of the LNG spill impoundment systems may require dewatering of the excavation throughout the construction activity. Dewatering may also be required during excavation of fill materials from beneath the LNG tanks. All dewatered material would be evaluated for contamination prior to removal in accordance with the Health and Safety Plan and Sampling and Analysis Plan discussed in section 4.2.2.2. If sampling indicates that the dewatered material is within the pretreatment standards set by a municipal water treatment plant, the material would be hauled to that plant. If decontamination is required before hauling, SES would consult with the POLB, the RWQCB, and other applicable agencies and would apply for and abide by the terms of any necessary permits. Implementation of these measures would reduce the impacts of dewatering on groundwater resources to less than significant levels. Other excavations during construction, including for the pipelines, would be no deeper than 15 feet and would not encounter groundwater or require dewatering. All excavations would require coordination with the Navy and the Base Reuse and Closure regulators.

Accidental Spills or Leaks of Hazardous Materials – Accidental spills or leaks of hazardous materials associated with equipment failures; the refueling or maintenance of vehicles; or the storage of fuel, oil, and other fluids during construction pose a risk to groundwater resources. Spills or leaks of hazardous liquids could contaminate groundwater and affect aquifers. If not cleaned up, contaminated soils could continue to leach and add pollutants to the groundwater long after a spill has occurred. Impacts associated with spills or leaks of hazardous liquids could be avoided or minimized by restricting the location of refueling and storage facilities and by requiring cleanup in the event of a spill or leak.

SES has developed BMPs as part of its SWPPP (see Appendix B) that would minimize the likelihood and potential impact of a hazardous spill during construction of the project facilities. These BMPs are outlined in the Spill Procedure portion of the SWPPP and include:

- training of contractor personnel on the contents and requirements of the Spill Procedure;
- specifications for the storage and secondary containment of fuel and other hazardous liquids in containers;
- enclosure of painting operations to prevent drift, and prohibition of exterior painting during rainfall events;
- prohibition of machinery, vehicle, and equipment washing on the site;
- a requirement for daily inspection of vehicles, stationary equipment, secondary containment areas, and spill response areas for leaks and deterioration; and
- notification, response, and cleanup procedures in the event of a spill, including the use of absorbent materials to recover spilled liquids, the construction of earthen berms to contain spilled liquids, and the removal of impacted soil for appropriate disposal in accordance with applicable regulations.

These measures adequately address the storage and transfer of hazardous liquids and the response to be taken in the event of a spill. Implementation of SES' Spill Procedure would reduce the potential impacts on groundwater associated with a hazardous spill or leak during construction to less than significant levels.

Operation

Potential operational impacts on groundwater include an accidental spill or leak of hazardous materials during operation of the project facilities and water requirements for the LNG terminal vaporization process, firewater system, and miscellaneous potable water needs. The measures in SES' Spill Procedure described above would reduce the potential impact on groundwater associated with a hazardous spill or leak during project operation to less than significant levels. SES' operational water requirements are described below.

SES would utilize a vaporization process that would use hot water as an intermediate heat transfer fluid to supply heat to warm the LNG and convert it back to a gaseous state. Because this water would be in a closed circulation system, there would be no water intake or discharge as part of normal operation of the vaporization equipment. The closed-loop system would require a one-time purchase of 100,000 gallons of deaerated fresh water supplemented by a one-time purchase of 10,000 gallons of deaerated fresh water for makeup water.

SES would use a looped underground firewater distribution piping system serving hydrants, firewater monitors, hose reels, water spray, or deluge and sprinkler systems. A one-time purchase of 1 million gallons of fresh water would be needed to fill the firewater storage tank. After the initial fillings, an estimated 4.8 million gallons of fresh water would be needed annually to replace the firewater after the required monthly fire pump testing. An additional estimated 1.2 million gallons of fresh water would be required annually for general operation of the facility.

All of the operational water would be obtained from the POLB and the City of Long Beach municipal water system. SES would negotiate with the City of Long Beach or a local supplier to determine appropriate fees and to ensure that the project would have no impact on water availability in the area. As discussed in section 4.3.2.2, the City of Long Beach Water Department (2005) does not consider this volume of water to represent a large volume to the municipal system.

In summary, by implementing the measures described above, adverse impacts on groundwater quality and availability due to project construction and operation would be avoided or reduced to less than significant levels.

4.3.3 Surface Water Resources

4.3.3.1 Environmental Setting

Historically, Los Angeles and Long Beach Harbors consisted of marshes and mudflats with a large marshy area to the north. Water flow from the Los Angeles River formerly entered the harbors where the Dominguez Channel now drains. Near the beginning of the 20th century, channels were dredged, marshes were filled, wharves and a breakwater were constructed, and the Los Angeles River was diverted. Eventually, two more breakwaters enclosed the greater San Pedro Bay and deep entrance channels were dredged to allow for entry of ships requiring up to 70 feet of clearance. Currently, the harbors are within the Dominguez Channel Watershed. This watershed includes about 110 square miles of land in the southern portion of Los Angeles County, 96 percent of which is developed. Land within the watershed is predominantly covered by impermeable surfaces. Rather than being defined by the natural topography of its drainage area, the boundary of the Dominguez Channel Watershed is defined by a complex network of storm drains and smaller flood control channels. The Dominguez Channel extends from the Los Angeles International Airport to the Los Angeles Harbor and drains large, if not all, portions of the Cities of Inglewood, Hawthorne, El Segundo, Gardena, Lawndale, Redondo Beach, Torrance, Carson, and Los Angeles.

Long Beach Harbor is divided into Outer, Middle, and Inner harbors. The proposed LNG terminal on Terminal Island would be adjacent to the West Basin of the Middle Harbor. Ships would access the terminal by entering the harbor through Queens Gate and following the Long Beach Main Channel into the Middle Harbor. Water depths within the harbor range from about -76 feet MLLW in the Long Beach Main Channel to -50 to -55 feet MLLW in the Middle and Inner Harbors. Both the natural gas and the C₂ pipelines would cross the Cerritos Channel located within the Inner Harbor. The pipelines would be installed at the same location in two separate HDD operations. At the point of the proposed crossings, the Cerritos Channel is 820 feet across and 56 feet deep. There are already several submerged pipelines installed across the Cerritos Channel at this location. The C₂ pipeline would also cross the Dominguez Channel. The pipeline would be installed on an existing pipe bridge that spans the channel at +28 feet MLLW. No other waterbodies would be crossed by the proposed facilities. General harbor circulation patterns and water quality within the West Basin and the Cerritos Channel are discussed below. Information on sediments within the West Basin and Cerritos Channel is included in section 4.2.3.

General Harbor Circulation Patterns

Currents in Long Beach Harbor are driven primarily by tides and wind. There is a general influx of water through Queens Gate and Angels Gate (the main entrance to the POLA), and an outflux at the eastern end of Long Beach Harbor. The tides are mixed semidiurnal, with two unequal high tides and two unequal low tides every 25 hours. Tidal height and velocities vary with the moon phase.

Surface water circulation in the Outer Harbor is clockwise, moving from the Los Angeles Main Channel to the Navy Mole, and there is a counter-clockwise eddy at a depth of 20 feet (POLB, 2003a). Tidally driven circulation fluctuates, with less mixing in the Inner Harbor than in the Outer Harbor. The greatest flushing rates occur at the harbor entrances and the lowest flushing rates occur in the Cerritos Channel and the Middle Harbor (URS, 2003). Maloney and Chen (1974) reported estimates for flushing rates of the entire harbor complex at about 90 tidal cycles.

Surface water circulation within the West Basin is primarily driven by the tides. Ebb currents flow out of the West Basin through the Long Beach Main Channel opening between the end of the Navy Mole and Pier F during periods of falling tides. Conversely, flood currents flow into the West Basin through the same opening during periods of rising tides. The velocities of tidal currents within the West Basin are generally less than 0.1 foot/second (Los Angeles Contaminated Sediments Task Force, 2003).

Water Quality

Water quality within the harbor is affected by combinations of hydrology, currents, storm water runoff, industrial discharges, ship traffic, and dredging activities. Discharges into the harbor complex include once-through cooling water from the Long Beach Generating Station in the Back Channel of the Inner Harbor and wastewater discharge in the Los Angeles Outer Harbor from the Terminal Island Treatment Plant. Non-point or diffuse sources that carry contamination into the harbor complex include aerial fallout, surface runoff, advective transport, and boating/shipping activities.

MEC Analytical Systems, Inc. (MEC) collected water quality data from 32 monitoring stations throughout the general project area as part of a study entitled *Ports of Long Beach and Los Angeles Year 2000 Biological Baseline Study of San Pedro Bay* (MEC, 2002). Generally, dissolved oxygen (DO) concentrations, acidity/alkalinity (pH) levels, salinity conditions, and water temperatures were within normal ranges for estuarine and near-coastal waters of the region. Although water clarity (measured as a percentage of light transmittance) was within ranges expected for coastal ports and harbors, water clarity within the study area was found to be generally lower than typical open coastal waters. In particular,

water clarity in bottom waters within the ports was lower than that of surface and mid-depth waters. These lower transmissivity values were attributed to the resuspension of bottom sediments due to natural processes such as currents or human activities, including dredging/disposal and propeller wash from large ships.

The POLB conducted water quality monitoring in 1999 and 2000 during dredging operations at the Pier T Marine Terminal adjacent to the LNG terminal site [MBC Applied Environmental Sciences (MBC), 2001a and 2001b]. Water quality parameters including depth, DO, pH, and percent light transmittance were measured weekly during dredging operations. Water quality parameters measured monthly included total suspended solids (TSS) and chemistry analysis. Results showed that DO averaged between 7 and 8 milligrams per liter and ambient low DO conditions occurred in the West Basin whether or not dredging was occurring. Dredging affected light transmission at monitoring stations within 300 feet of the dredging operations. Substantial decreases in light transmission in the water column were often observed and were likely the result of sediments disturbed during dredging (dredge plume). These areas were generally confined to the bottom few meters of the water column. There was no indication that TSS values within 300 feet of dredge sites were significantly elevated during dredge activities (MBC, 2001a and 2001b). The five metals detected throughout the dredge surveys (arsenic, copper, lead, selenium, and zinc) were also detected during the pre-dredge survey. The other analytes detected during the surveys (polychlorinated aromatic hydrocarbons) were found at very low concentrations, close to detection limits. Concentrations in the harbor were well below the EPA standard levels. PCBs and DDT were not detected during any surveys (MBC, 2001a and 2001b).

Regulatory Requirements

The HDDs of the Cerritos Channel, installation of the C₂ pipeline on the pipe bridge over the Dominguez Channel, reinforcement of the shoreline structures, construction of the LNG ship berth and unloading facility, and dredging would be regulated by the ACOE under section 10 of the Rivers and Harbors Act and section 404 of the CWA. Section 10 of the Rivers and Harbors Act regulates any work or structures that potentially affect the navigable capacity of the waterbody. Section 404 of the CWA regulates the discharge of dredged or fill material into waters of the United States.

In addition to the ACOE's permitting responsibilities, a CWA section 401 water quality certification or California Water Code Waste Discharge Requirements (WDR) permit would need to be obtained from the RWQCB for the dredging activities.

Hydrostatic test water and storm water discharges are also regulated activities in California. SES would need to obtain a General NPDES Permit and WDR permit for Discharges of Hydrostatic Test Water to Surface Waters in Coastal Watersheds of Los Angeles and Ventura Counties from the RWQCB; an NPDES General Permit for Storm Water Discharges Associated with Construction Activity would need to be obtained from the CSWRCB.

4.3.3.2 Impact and Mitigation

Construction

Activities associated with construction of the project facilities, including reinforcement of the shoreline structures, construction of the LNG ship berth and unloading facility and associated dredging, the HDDs of the Cerritos Channel, installation of the C₂ pipeline over the Dominguez Channel, hydrostatic test water discharge, storm water runoff, and accidental spills or leaks of hazardous materials could adversely affect surface water quality and/or water circulation within Long Beach Harbor as described below.

Reinforcement of the Shoreline Structures, Construction of the LNG Ship Berth and Unloading Facility, and Associated Dredging – Reinforcement of the shoreline structures and construction of the LNG ship berth and unloading facility would involve permanent in-water structures (e.g., mooring and breasting dolphins, unloading platform, rock buttresses). Given the low tidal velocities and existing water circulation patterns within the West Basin, these new structures are expected to have only a minor impact on water circulation in localized areas in the immediate vicinity of the new structures at Pier T and are not expected to have a measurable impact on the general water circulation patterns within the West Basin.

To safely accommodate the largest LNG ships expected to use the LNG terminal, the POLB would dredge the ship berth area on the west side of Pier T to a depth of -55 feet MLLW. Current water depths adjacent to Pier T range from -46 feet to -53 feet MLLW. To achieve a uniform depth of -55 MLLW at the LNG ship berth would require the removal and disposal of up to approximately 175,000 cubic yards of sediments. Additionally, installation of the rock buttresses at Berth T-126 and Berth T-124 would require the dredging of between 100,000 and 300,000 cubic yards of sediments depending on the west wharf improvement and rock buttress configuration option chosen.

Potential impacts on water quality from the dredging activities would primarily result from resuspension of sediments into the water column, which could cause increased TSS levels and decreased water clarity. In addition, the abundance of fine, organically enriched sediments within the work area would make resuspension of contaminated sediments into the water column a possibility (see section 4.2.3). Past dredging experience within the area has shown that impacts on water quality are relatively short term and localized. For example, TSS values within 300 feet of dredge sites near Pier T were not significantly elevated during dredging activities (MBC, 2001a and 2001b). Part of the reason for this is that the slow currents in the Middle Harbor (and the West Basin specifically) minimized the extent that suspended sediments were transported from the dredged area. Additionally, conducting dredging operations in a manner that is consistent with the requirements of the ACOE's section 404 and the RWQCB's WDR permits as described below minimizes impacts on water quality.

A standard provision of the ACOE's section 404 permit specifies BMPs that must be followed to minimize impact on waters of the United States. For example, these BMPs limit the amount of water and dredged material that would flow over the sides of the barge(s) used to transport dredged materials. These BMPs include time restrictions on flow back of dredged water and materials from the barge at the dredging site and load level restrictions to preclude spillage of water and dredged materials during transit and at the disposal site. Another standard provision of the section 404 permit requires the POLB to prepare a Dredge and Disposal Plan for submission to the ACOE at least 15 days before initiation of any dredging activities. The Dredge and Disposal Plan would include:

- a list of all vessels, major dredging equipment, and electronic positioning systems or navigation equipment that would be used for dredging and disposal operations, including the capacity, load level, and acceptable operating sea conditions for each dredge or disposal barge;
- a detailed description of the dredging and disposal operation, including a schedule and detailed pre-and post-construction monitoring plan;
- a predredging bathymetric condition survey that depicts the entire dredging area, the dredging design depth, overdredge depth, and side-slope ratio as well as the total quantity of dredged material to be removed from the dredging and side-slope areas; and
- a debris management plan to prevent disposal of large debris at the disposal location.

A standard provision of the RWQCB's WDR permit requires that the dredging, excavation, or disposal of dredge materials shall not cause any of the following conditions in the receiving waters:

- the formation of sludge banks or deposits of waste origin that would adversely affect the composition of the bottom fauna and flora, interfere with fish propagation or deleteriously affect fish habitat, or adversely change the physical or chemical nature of the bottom;
- turbidity that would cause a substantial visible contrast with the natural appearance of the water outside the immediate area of operation. This is interpreted as increases in turbidity that exceed 20 percent of the background levels at control sites;
- discoloration or visible material, including oil and grease, either floating on or suspended in the water or deposited on beaches, shores, or channel structures outside the immediate area of operation;
- objectionable odors emanating from the water surface;
- depression of DO concentrations below 5.0 milligrams per liter at any time outside the immediate area of operation; or
- any condition of pollution or nuisance.

The RWQCB's WDR permit would also establish a monitoring and reporting program that the POLB would follow to ensure that significant levels of contaminants would not be released to the harbor waters or adversely affect beneficial uses of the harbor.

Some of the sediments that would be dredged are expected to contain contaminants. Therefore, the POLB currently plans to dispose of the sediments at a confined disposal site previously approved for contaminated materials within Long Beach Harbor (e.g., ITS Slip fill, East Basin Slip 1 fill, or upland site). The POLB could propose to dispose of uncontaminated dredged materials at an unconfined aquatic location (i.e., Western Anchorage Temporary Sediment Storage Site). In order to determine disposal site suitability, the POLB would prepare and implement a Sampling and Analysis Plan in accordance with the three-tiered testing protocols in the EPA/ACOE Inland Testing Manual. Based on the results of the tiered testing protocols, the ACOE would review and approve or deny the use of an unconfined aquatic location, or alternately approve the POLB's request to take the materials to a confined or upland site.

The POLB would have a dredging operations inspector present at all times to ensure compliance with all relevant permit conditions during dredging and disposal operations. Implementation of the POLB's Dredge and Disposal Plan and disposal of all sediments at approved sites would reduce impacts on water quality associated with the in-water work to less than significant levels.

HDDs of the Cerritos Channel – To minimize impacts on the Cerritos Channel, the proposed natural gas and C₂ pipelines would be installed under the waterbody using the HDD construction method. This technique would involve drilling pilot holes from one side of the channel to the other and then enlarging the holes through successive reamings until the holes are large enough to accommodate the pipes. Pipe sections long enough to span the crossing would be fabricated on the opposite side of the channel and then pulled through the drilled holes. Current information indicates that the substrate of the Cerritos Channel is conducive to the HDD construction method given that two 24-inch-diameter pipelines have previously been installed at the proposed crossing location and a 36-inch-diameter pipeline was

recently installed under the channel just west of the Heim Bridge (about 1 mile west of the proposed crossing location) using the HDD technique without incident.

The natural gas and C₂ pipelines would be installed as two separate HDDs. The HDDs of the Cerritos Channel would be approximately 2,700 feet in length. The pipelines would be installed a maximum of 50 feet below the deepest part of the channel bottom or about 90 feet bgs, which is well below the existing submerged pipelines across the channel. SES proposes to set up the drill rig for the HDDs at the Long Beach Generating Station, about 1,000 feet from the southern edge of the Cerritos Channel. The drills would exit on the north side of the channel about 300 feet from the water's edge. The drilling operations would be confined to a 200-foot by 200-foot temporary extra workspace at the HDD entry sites and a 100-foot by 100-foot temporary extra workspace at the HDD exit sites. The pipe strings would be laid out on the north side of the Cerritos Channel along Carrack Avenue. Because the natural gas and C₂ pipelines would not be constructed concurrently, no additional staging areas would be necessary. The use of the HDD construction method would avoid the need to trench through the waterbody and would eliminate equipment disturbance within the waterbody. As a result, there would be no alterations to armoring of the bed or banks of the Cerritos Channel that could result in short- or long-term erosion.

The HDD process uses a drilling fluid to seal the walls of the drillhole, cool and lubricate the drill bit, and transport the drill cuttings back to the beginning of the drillhole. The drilling fluid proposed for use during the HDD crossings of the Cerritos Channel would be a non-toxic mixture of bentonite clay and water with no additives. If the use of additives becomes necessary, the proposed additives would be submitted to the POLB, the Cities of Long Beach and Los Angeles, and the ACOE for approval before use.

Depending on the subsurface conditions along the drill paths, it is possible that some of the drilling fluid could be inadvertently released into the Cerritos Channel during the drilling operation. Unlike a fresh water environment, the high salt concentration in sea water would result in rapid flocculation of the solid particles in any drilling fluid released into the channel. The flocculated particles would settle to the channel bottom quite rapidly, resulting in negligible dispersal of the drilling fluid in the water column down current of the site where the fluid is released.

SES prepared an HDD Plan (see Appendix C) to minimize impacts associated with an inadvertent release of drilling fluid. The HDD Plan includes a description of:

- the HDD construction process;
- monitoring procedures;
- containment and control measures to be implemented in the event there is an inadvertent release of drilling fluid in a waterway or on land;
- procedures for notifying officials in the event of an inadvertent release of drilling fluid;
- measures for the storage of lubricants and fluids to be used during the HDD process;
- hazardous materials contingency plans; and
- abandonment measures to be followed in the event problems are encountered during the HDD process.

The HDD Plan does not, however, address the steps that would be taken if an existing submerged pipeline is hit during the HDD operations. Therefore, **the Agency Staffs will recommend to their respective Commissions that the following measure be included as a specific condition of any approvals issued by the FERC and the POLB:**

- **SES shall revise its HDD Plan to describe the procedures that would be followed if an existing submerged pipeline is encountered during the HDD operations. SES shall file the revised HDD Plan with the FERC and the POLB for the review and written approval of the Director of the Office of Energy Projects (OEP) and the POLB Director of Planning before construction.**

SES would obtain a section 10 permit from the ACOE for the crossings of the Cerritos Channel and adhere to its terms and conditions. Adherence to the measures included in the ACOE permit and implementation of SES' revised HDD Plan would reduce the potential impacts associated with the HDD crossings of the Cerritos Channel to less than significant levels.

Installation of the C₂ Pipeline Over the Dominguez Channel – To minimize impacts on the Dominguez Channel, the C₂ pipeline would be installed on an existing pipe bridge that spans the channel at +28 feet MLLW. The only potential impact on water quality from this aerial crossing would occur as a result of an accidental spill or leak from construction equipment (see discussion of accidental spills or leaks below).

A section 10 permit would be obtained from the ACOE for the aerial crossing of the channel. Adherence to the measures included in the ACOE permit would reduce the potential impacts associated with the crossing of the Dominguez Channel to less than significant levels.

Hydrostatic Test Water Discharge – As discussed in section 4.3.2.2, the 24.7 million gallons of water needed for hydrostatic testing of the LNG storage tanks and pipelines would be obtained from the POLB and City of Long Beach municipal water system. Discharge of the hydrostatic test water would make a one-time, temporary demand on the POLB storm water drainage system. The POLB's storm water drainage system outfalls to surface water resources in the Port.

SES would obtain a General NPDES Permit and WDR permit for Discharges of Hydrostatic Test Water to Surface Waters in Coastal Watersheds of Los Angeles and Ventura Counties from the RWQCB and adhere to its terms and conditions. No chemicals or additives would be added to the test water and the test water would be sampled before use and before discharge. Following testing, the water would be discharged into the POLB storm water drainage system. Because the storm water drainage system outfalls ultimately flow into surface waters in the Port, the addition of this volume of fresh water could temporarily reduce salinity concentrations at the outfall locations. This influx of fresh water to the storm water system would be similar to that of a heavy rain during a storm event. SES would coordinate with the POLB to ensure necessary storm drain capacity exists for storm events during discharges of hydrostatic test water so as not to exceed the capacity of the system. Implementation of these measures would reduce impacts associated with hydrostatic test water discharges on surface waters to less than significant levels.

Storm Water Runoff – Storm water runoff associated with the proposed project could affect water quality within the POLB. SES has prepared a draft site-specific SWPPP for the Long Beach LNG Import Project (see Appendix B) in accordance with the CSWRCB's NPDES General Permit for Storm Water Discharges Associated with Construction Activity. This plan would apply to the entire construction work area, including the temporary construction laydown and worker parking area and barges. Some of the

pertinent measures in the SWPPP that would be implemented during construction of the proposed project include:

- using erosion and sediment controls (e.g., sandbags, silt fence, sediment basins);
- sweeping entrances and exits to minimize offsite tracking of sediments;
- minimizing the area of exposed soils during construction and paving areas of exposed soils after construction is completed to keep the site stabilized;
- implementing waste management control procedures to keep the site clean and reduce the potential for non-hazardous and potentially hazardous waste from coming in contact with storm water or non-storm water discharges;
- routing all storm water associated with the proposed project towards the POLB's existing storm water drainage system and permitted outfalls; and
- requiring at least one EI to be responsible for ensuring compliance with the requirements of the SWPPP as well as other environmental permit and approval conditions.

SES would file its final site-specific SWPPP with the FERC and the POLB for approval before construction. Implementation of the measures in SES' SWPPP would avoid or minimize impacts on water quality associated with storm water runoff during construction. As such, impacts on water quality as a result of stormwater runoff during construction would be reduced to less than significant levels.

Accidental Spills or Leaks of Hazardous Materials – Despite BMPs (e.g., secondary containment, vehicle maintenance procedures, berming, etc.), spills, leaks, or accidental releases of fuels, lubricants, or other hazardous substances during construction of the proposed project could adversely affect water quality. However, implementation of the measures in SES' Spill Procedure described in section 4.3.2.2 and included in Appendix B would reduce the potential impact on surface water resources associated with a hazardous spill or leak during construction to less than significant levels.

Operation

Operational impacts on water quality include the potential to contribute additional pollutants to the waterbody via accidental spills or leaks of hazardous materials, storm water runoff, or an LNG spill. There would be no intake or discharge of sea water during operation of the proposed project facilities. As discussed in section 4.3.2.2, operational water requirements for the proposed project facilities would be obtained from municipal sources.

Accidental Spills or Leaks of Hazardous Materials – Implementation of the measures in SES' Spill Procedure would reduce the potential impacts on surface water resources associated with a hazardous spill or leak during project operation to less than significant levels.

Storm Water Runoff – Once construction has been completed, activities at the LNG terminal site would have an ongoing potential to cause pollution via storm water runoff. BMPs consisting of permanent features and operational practices designed or implemented to minimize the discharge of pollutants in storm water or non-storm water flows from the LNG terminal site would be implemented by SES in accordance with its SWPPP once construction is completed and the facility is operational. Some of these operational BMPs would include:

- use of a spill prevention and containment plan that would describe specific procedures for planning and prevention, personnel training, container storage and secondary containment structures, leak and structural integrity inspections, fuel and hazardous material handling, spill handling, and material disposal;
- proper disposal and/or recycling of waste materials at licensed facilities;
- avoidance of practices where used water that has been in contact with pollutants flows directly into the storm drain system;
- maintenance of the existing storm drain system;
- keeping pollutants off of surfaces that are exposed to storm water; and
- installation of treatment controls such as on-site retention/detention basins and catch basin filters where necessary to remove pollutants from storm water before it enters the storm drain system.

Implementation of the measures in the SWPPP would reduce impacts on water quality associated with storm water runoff during operation to less than significant levels.

4.3.4 Wetlands

A review of National Wetlands Inventory maps, confirmed by field reconnaissance, shows no wetlands within 150 feet of the LNG terminal site, temporary construction laydown and worker parking area, pipeline facilities, or electric distribution facilities. Therefore, construction and operation of the proposed project would have no impact on wetland resources.

4.4 BIOLOGICAL RESOURCES

4.4.1 Significance Criteria

Impacts on biological resources would be considered significant if project construction or operation would:

- substantially affect local resident or migratory fish and wildlife populations, including any rare or endangered species, or the habitats, including EFH, that support those populations; or
- result in a long-term reduction or alteration of unique, rare, or special concern vegetation types (e.g., riparian vegetation) or natural communities.

4.4.2 Terrestrial Resources

The terrestrial environment within the POLB and the surrounding cities is highly developed, and a majority of the area is paved or occupied by buildings. Terrestrial vegetation in the project area consists of weeds and ornamental plants, all of which are common in industrialized areas of southern California (Department of the Navy, 1997). Weed species may include telegraph weed, horse weed, Russian thistle, tree tobacco, and mustard. Ornamental species may include fan palms, carob trees, coral trees, Indian laurel, and eucalyptus. No fresh water wetlands; native terrestrial habitats; or plants of federal, state, regional, or local concern are currently known to occur on the proposed LNG terminal site, construction laydown and worker parking area, along the route of the pipelines and electric distribution facilities, or in the nearby area.

Due to the highly developed nature of the POLB and the lack of vegetative habitats, the terrestrial environment in the project area supports few wildlife species. Feral cats, Norway rats, and common house mice are prevalent throughout the project area. Common urban bird species expected along the pipeline routes include the American crow, rock dove (pigeon), mourning dove, European starling, and house sparrow. Birds closely associated with the marine environment are discussed in section 4.4.3.2. Federal and state-listed threatened or endangered bird species that could be expected to occur intermittently within and near the project area include the California brown pelican, California least tern, and American peregrine falcon. These species are discussed in detail in section 4.4.4.1.

Construction and operation of the proposed project could directly and indirectly impact terrestrial plant and wildlife species. Any individual plants growing within the LNG terminal site and receiver sites located at the end of each of the pipeline routes would be permanently removed. Plants removed from the construction work area for the pipelines and electric distribution facilities would be allowed to naturally revegetate. The proposed project would not result in a long-term reduction or alteration of unique, rare, or special concern vegetation types or natural communities. Wildlife would be impacted through disturbance and displacement; however, individuals in the area are acclimated to the industrial nature of the POLB, routinely experience disturbance associated with Port activities, and would likely relocate into adjacent habitats. The proposed project would not have a measurable impact on the local populations of any plant or wildlife species. As a result, the overall impact on terrestrial vegetation and wildlife resources from construction and operation of the proposed project would be less than significant.

4.4.3 Marine Resources

The Los Angeles and Long Beach Harbors were originally an estuary of the Los Angeles River, with additional fresh water flow from the San Gabriel River to the east. The natural mudflats and

marshlands provided habitat for birds, fish, and invertebrates. The barrier beach of Rattlesnake Island served as nesting habitat for terns and shorebirds. However, development of the harbors through dredging, filling, and channelization has altered the local estuarine physiography and habitats over the past 100 years. The Los Angeles and Long Beach Harbors lack the characteristics associated with typical estuaries because there is no distinctive salinity gradient; very little sandy beach and shallow water habitat and virtually no saltmarsh habitat remain; and expanding deep water habitat and increased amounts of substrates available for sessile and fouling organisms (i.e., bulkheads, shoreline breakwaters, riprap, and pier pilings) have altered benthic habitats.

The existing marine environment and potential impacts associated with the proposed project on marine organisms, water-associated birds, and EFH assessment are discussed below. Much of the information on the existing environmental conditions in the project area comes from a biological baseline study entitled *Ports of Long Beach and Los Angeles Year 2000 Biological Baseline Study of San Pedro Bay* (MEC, 2002).

4.4.3.1 Marine Organisms

Environmental Setting

Typical of an industrial harbor, the major marine habitats found in Long Beach Harbor include the water column, low-relief sediment bottom, and fabricated or high-relief solid substrates (i.e., wooden and concrete pilings, steel sheet pile and concrete bulkheads, riprap, and rock dikes). Information on sediments and surface water quality is included in sections 4.2.3 and 4.3.3, respectively. Marine organisms found in the project area include marine vegetation, benthic organisms, fish, and marine mammals.

Marine Vegetation – For purposes of this discussion, macroalgae and eelgrass are referred to jointly as marine vegetation. Although Long Beach Harbor is highly developed, consisting primarily of harbor-related structures such as navigation markers, docks, containment booms, piers, and ship hulls support macroalgal communities. Common species within these communities include sargassum, giant kelp, feather boa kelp, turf and short-foliose red algae, and green algae (MEC, 2002). Eelgrass communities, which are considered sensitive and are protected by both federal and state agencies, exist in certain intertidal and subtidal areas. However, the nearest significant area of eelgrass is located near Pier 300 in Los Angeles Harbor, about 1 mile west of the proposed LNG terminal site. A small patch of eelgrass (probably a single plant) has been identified along the shoreline of Pier A at Berth A88 in the Cerritos Channel.

Benthic Organisms – Benthic organisms, many of which are not mobile or are of limited mobility, live within, on, or associated with the sediment or substrate. Benthic organisms living in the substrate, especially in a soft sea bottom, are identified as infauna. Benthic organisms living on the substrate or on other organisms are identified as epifauna. Further distinction is made between epifauna living above the low tide mark (intertidal), therefore living partly above water and partly below depending on the tide, and epifauna living completely submerged under water (subtidal). The following discussion divides benthic organisms into two categories: benthic infauna and rocky intertidal/subtidal epifauna.

Benthic infauna, the macroscopic animals that live in the top layers of sediment on the ocean floor include polychaetes, mollusks, and crustaceans. These species serve as food for larger invertebrates (e.g., epibenthic crabs) or demersal fish (e.g., white croaker, queenfish). The distribution of benthic infauna depends on interacting sediment and other environmental variables (e.g., water depth and circulation). For example, the grain size of the sediment determines a variety of infaunal habitat characteristics including abrasion, amount of interstitial water, ease of burrowing, and materials for tube

or burrow construction. Within Long Beach Harbor there is generally a gradient of increasing habitat quality from the Inner to the Outer Harbors. The Inner Harbor is characterized by high silt and clay sediments with some accumulation of industrial and domestic wastes. These habitat conditions correspond to relatively low species diversity. The Outer Harbor is characterized by assemblages of benthic infaunal species associated with relatively high quality habitats. Areas that have recently been dredged have similar species assemblages as non-dredged areas, but there are generally fewer species and a lower abundance of individuals within a species, indicating that the recently dredged areas are still in the colonization phase.

Rock or concrete habitats occupy much of the shoreline in Long Beach and Los Angeles Harbors (e.g., cement pilings or slabs, rock breakwaters, riprap-armored shorelines), extending from the upper intertidal zone to the subtidal zone. The upper and lower intertidal zones in the West Basin consist of large cement slabs, while cement slabs and rocks make up the substrate in the subtidal zone. The upper and lower intertidal zones in the Cerritos Channel consist of small boulders, 1 to 2 feet in diameter, and the subtidal zone is characterized by silt with shell hash and a few rocks. These hard substrates, as well as pier/bulkhead pilings, provide intertidal and subtidal habitats for as many as 265 species of both attached and mobile invertebrates. The West Basin has relatively high numbers of the Mediterranean mussel, the clam (*Lasaea subviridis*), and the brittlestar. Other intertidal and subtidal epifauna that occur in the project area include barnacles, limpets, chitons, snails, and sea anemones.

Fish – Approximately 130 species of fish are known to inhabit or frequent the waters of the Los Angeles and Long Beach Harbors; 60 to 70 of those species are considered common (POLB, 2003a). The most common fish species within the West Basin include the northern anchovy, California grunion, chub mackerel, jack mackerel, sardine, topsmelt, and widely distributed queenfish and specklefin midshipman. In comparison with other areas in Los Angeles and Long Beach Harbors, the West Basin has a relatively high number of white croaker (MEC, 2002). Based on recent survey data, the relative abundance of fish is dependent on the season, with fish being the most abundant during the summer. Juveniles are more common from samples in the Inner and Middle Harbors compared to the Outer Harbor. The northern anchovy supports a commercial bait fishery in the Los Angeles and Long Beach Harbors, as does the Pacific sardine. Generally, recreational fishing in the Los Angeles and Long Beach Harbors is discouraged because of heavy metal contamination of certain species of fish. Commercial and recreational fishing are not allowed in the West Basin of the Middle Harbor. EFHs of managed species are further discussed in section 4.4.3.3.

Marine Mammals – No cetaceans (whales and dolphins) regularly inhabit the harbor (MEC, 2002). However, occasionally individuals or small groups of common and Pacific white-sided dolphins have been reported within the harbor waters, and three or four California grey whales are sighted annually in or near the Outer Harbor. Two species of pinnipeds, the California sea lion and harbor seal, are relatively common within the harbor. These species are most abundant on the breakwaters and foraging in the outer portions of the harbor. All marine mammals are fully protected under the Marine Mammal Protection Act (see section 4.4.4.7). No marine mammals are expected to use the project site except for occasional foraging (POLB, 2003a).

Impact and Mitigation

Activities associated with construction of the facilities include dredging, reinforcement of the shoreline structures, and construction of the LNG ship berth and unloading facility. Noise and the accidental release of hazardous materials associated with these activities could impact marine organisms that occur in the project area within Long Beach Harbor. Overall, none of these impacts would substantially affect local resident or migratory marine organisms and, as such, are not considered significant as discussed below.

The dredging of approximately 275,000 to 475,000 cubic yards of sediments to prepare the LNG ship berth and reinforce the shoreline structures would destroy the benthic infauna of the dredged sediments and temporarily displace mobile organisms, such as fish. In addition to the direct disturbances to the bottom substrates, dredging activities would temporarily increase turbidity and the presence of suspended sediments in the water column, which could indirectly affect marine organisms. Temporary increases in turbidity and suspended sediment loads may expose organisms to contaminated sediments or result in decreased feeding rates and increased metabolic costs in some benthic invertebrates. In some cases, disturbed sediments settling out of the water column could smother benthic organisms. Mobile vertebrates and invertebrates may temporarily move away from the construction area in response to elevated turbidity or reduced oxygen levels. However, many vertebrate and invertebrate predators would quickly return to the disturbed area to feed on benthic species exposed or killed by dredging activities. The benthic community outside the dredge area and local turbidity levels would be expected to return to baseline conditions following the completion of construction activities. Benthic communities in the dredge area could take up to 3 years to recolonize.

The area affected by these suspended sediments would be dependent on the local currents and the particle size of the sediments (e.g., heavier particles settle out of suspension more quickly). As described in section 4.3.3.2, previous studies conducted in 1999 and 2000 during dredging activities at the Pier T Marine Terminal adjacent to the proposed project site found no indication that TSS values within 300 feet of the dredge sites were significantly elevated during dredging activities (MBC, 2001a and 2001b). In addition, monitoring of larger dredging projects within San Pedro Bay (e.g., Pier T, Pier 400) has shown that turbidity associated with dredging is short term and localized and that compliance with the requirements of the ACOE's section 404 permit and the RWQCB's WDR permit results in minimal turbidity.

Benthic organisms characterizing this area are dominated by species generally reported to be able to recolonize adjacent areas within 6 to 36 months following severe physical disruptions, such as dredging (Soule, 1976; POLB, 2003a; Reish, 1957; Harbors Environmental Projects, 1976). The timing of dredging may affect recolonization. For example, peak reproduction has been found to occur in spring and again in late summer to early fall. A study of benthic recolonization in Los Angeles Harbor between 1978 and 1986 to 1987 indicated no long-term effect from dredging (MEC, 1988).

The short-term loss of benthic organisms in a small portion of the harbor is generally recognized as an insignificant impact on aquatic resources. For previous larger dredging/landfill projects (e.g., Pier J South and Pier 400) the wildlife resource agencies with jurisdiction [i.e., the U.S. Fish and Wildlife Service (FWS), NOAA Fisheries, and the CDFG] recognized the short-term nature of the construction impacts. Additionally, benthic communities would be expected to repopulate following the completion of construction activities. Therefore, the overall impact of dredging associated with the proposed project on marine organisms would be less than significant.

Additionally, activities associated with the reinforcement of the shoreline structures and construction of the LNG ship berth and unloading facility could directly affect benthic and fish species during the removal or installation of any in-water structures (e.g., pilings, underwater rock buttress). Individuals of non-mobile species attached to hard substrates that are removed or covered would suffer mortality. Because these species are relatively widespread throughout the harbor and would recolonize new hard substrates within 2 to 3 years, these impacts would be less than significant.

Ship traffic and various construction or maintenance activities create a relatively "noisy" underwater environment within Long Beach Harbor. Research suggests that some marine organisms exhibit avoidance behaviors in response to noise from ship engines (International Council for the Exploration of the Sea, 1995). As such, project vessels (LNG ships, tugs, construction barges) operating

within Long Beach Harbor could create sounds that lead to responses in fish. Additionally, specific construction activities (e.g., driving steel piles) could also generate underwater sound pressure waves that potentially kill, injure, or cause a behavioral change in fish in the immediate vicinity of the construction activities (NOAA Fisheries, 2003). Given the abundance of fish in the harbor despite continuous maritime activity, marine organisms found in the project area have generally adapted to these “noisy” conditions. Accordingly, the impacts of construction on fish populations are considered insignificant.

There is also the potential for spills, leaks, or accidental releases of potentially hazardous materials to occur during construction of the proposed project. A discharge of hazardous materials into harbor waters could result in a significant impact on benthic invertebrates attached to the shoreline substrates. To minimize the potential for accidental releases of hazardous materials, construction of the proposed project would be conducted in accordance with SES’ Spill Procedure included as part of its SWPPP (see discussion in section 4.3.2.2 and Appendix B). The Spill Procedure specifies BMPs that would minimize the chances of a spill and, if a spill were to occur, minimize the chances of the spill reaching a waterbody. Additionally, the Spill Procedure includes measures to minimize impacts if a spill does occur and reaches a waterbody. Implementation of SES’ Spill Procedure would reduce impacts on marine organisms associated with a hazardous spill or leak to less than significant levels.

Several agencies expressed concern that operation of the LNG terminal would require the withdrawal and discharge of significant volumes of water from and to the harbor as part of the vaporization process and that this could impact some marine organisms (e.g., adult, juvenile, or larval fish). Vaporizers that use sea water were considered as an alternative to the ones proposed by SES, but were not considered appropriate for this proposed project (see section 3.6). Hot water pumped through coils in a natural gas-fired heat exchanger would be used as an intermediate transfer fluid to supply heat for LNG vaporization. This process would occur in a closed circulation system so no water intake or discharge would occur during normal operations. In addition, as described in section 2.7.1.4, the firewater supply and distribution system at the LNG terminal is intended to be run on fresh water from the POLB and the City of Long Beach municipal water system and would not require the intake of sea water. Therefore, the vaporization and firewater systems for the proposed project would not adversely affect marine organisms.

The LNG ships associated with the proposed project could import or export exotic species into or out of Long Beach Harbor. LNG ships would arrive at the LNG terminal fully loaded with LNG from locations throughout the Pacific region. To maintain a constant draft during the unloading operation, the LNG ship would bring on ballast water (about 8 to 18 million gallons, depending on the size of the ship) during transfer of its LNG cargo and retain this ballast water until after the LNG ship departs the harbor. The absence of ballast water discharges within the harbor would decrease the potential for importing an exotic species.

Construction of the pipelines would not impact marine organisms because in-water disturbances would be avoided by using the HDD method to cross the Cerritos Channel and an above-water pipe rack at the Dominguez Channel (see section 4.3.3.2).

4.4.3.2 Water-Associated Birds

About 100 bird species, including some federally and state-listed threatened or endangered species (see section 4.4.4), use habitats within Los Angeles and Long Beach Harbors for foraging, breeding, and/or nesting. About 70 percent of these birds are water-associated. The most abundant are western gulls, Heermann’s gulls, elegant terns, federally and state-listed least terns, federally and state-listed California brown pelicans, western grebes, Brant’s cormorants, and surf scoters. Riprap habitats associated with breakwaters tend to have the highest densities of birds in the harbors.

Dredging and construction activities associated with the Long Beach LNG Import Project would affect water-associated birds through disruptive noise and/or temporary loss or degradation of foraging habitats in the marine waters of the West Basin. Birds found in the area are acclimated to these types of activities and would use similar habitats in adjacent areas. Due to the temporary nature of the disruption, the overall impact on water-associated bird resources would be less than significant.

A nesting colony of black-crowned night herons is located at Gull Park on the Navy Mole near the mouth of the West Basin. This location, constructed in 1998 as mitigation for removal of nesting trees at the Long Beach Naval Station, was a successful mitigation site because the herons had accepted it as a rookery. During surveys in 2000 and 2001, biologists observed black-crowned night herons throughout the Los Angeles and Long Beach Harbors concentrated in the West Basin during the spring months. Peak numbers of individuals occurred in the rookery during May and June (MEC, 2002). More recent surveys have seen a marked decline in the number of individuals, possibly as a result of an ongoing groundwater remediation project being conducted onsite by the Navy. The black-crowned night heron rookery is located about 1,500 feet from the LNG terminal site, across open water. The rookery would not be directly affected by construction or operation of the proposed project because the project would be some distance away and would involve port-related activities that the birds are accustomed to. Indirect impacts such as noise and/or temporary loss or degradation of foraging habitat would be similar to those for other water-associated bird species and would be less than significant.

A scoping comment was received regarding the effects of additional light and glare associated with the project on migratory bird mortality. Construction of the proposed project would result in an incremental increase in ambient nighttime light levels at the proposed project site. While limited information exists on the specific effects of artificial light on birds and other wildlife, it is understood that artificial light can result in general disruptions in daily (i.e., nocturnal) activity cycles, behaviors, and/or migratory movements. Birds and other wildlife can also be indirectly impacted through alterations to habitats and effects on prey species. As natural habitats continue to be fragmented by development, additional sources of artificial light may exacerbate impacts on wildlife. However, the proposed project would not create a significant new source of light or glare that would adversely affect nighttime views in the area (see section 4.5.6). Because most of the facilities in the ports of Long Beach and Los Angeles are lit at night for safety, the project would only incrementally add to the existing source of light in the area. Therefore, light or glare created by the project would not have an adverse impact on birds or other wildlife.

4.4.3.3 Essential Fish Habitat Assessment

The MSA (Public Law 94-265 as amended through October 11, 1996) was established, along with other goals, to promote the protection of EFH in the review of projects conducted under federal permits, licenses, or other authorities that affect or have the potential to affect such habitat. EFH is defined in the MSA as those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity.

Section 302 of the MSA establishes eight regional fishery management councils. Among other responsibilities, these councils develop management plans for each fishery that requires conservation and management. Section 303(a)(7) of the MSA requires that these fishery management plans describe and identify EFH. The proposed project would be constructed and operated within the region of the Pacific Fishery Management Council (PFMC). The PFMC has published two amendments to its fishery management plans to address EFH in the project area. Amendment 11 to the Pacific Coast Groundfish Fishery Management Plan, published in the Federal Register on September 10, 1999 (64 FR 49092) addresses groundfish (PFMC, 1998a). Amendment 8 to the Northern Anchovy Fishery Management

Plan, published in the Federal Register on December 15, 1999 (64 FR 69888) addresses coastal pelagic species (PFMC, 1998b).

Federal agencies that authorize, fund, or undertake activities that may adversely impact EFH must consult with NOAA Fisheries. Although absolute criteria have not been established for conducting EFH consultations, NOAA Fisheries recommends consolidated EFH consultations with interagency coordination procedures required by other statutes, such as NEPA, the Fish and Wildlife Coordination Act, the ESA, and the Federal Power Act in order to reduce duplication and improve efficiency [Title 50 CFR Part 600.920(e)]. Generally, the EFH consultation process includes the following steps:

- 1) Notification – The action agency should clearly state the process being used for EFH consultations (e.g., incorporating EFH consultation into an EIS, section 10 permit, etc.).
- 2) EFH Assessment – The action agency should prepare an EFH Assessment that includes both identification of affected EFH and an assessment of impacts. Specifically, the EFH should include:
 - a description of the proposed action;
 - an analysis of the effects (including cumulative effects) of the proposed action on EFH, the managed fish species, and major prey species;
 - the federal agency's views regarding the effects of the action on EFH; and
 - proposed mitigation, if applicable.
- 3) EFH Conservation Recommendations – After reviewing the EFH Assessment, NOAA Fisheries should provide recommendations, if necessary, to the action agency regarding measures that can be taken by that agency to conserve EFH.
- 4) Agency Response – Within 30 days of receiving the recommendations, the action agency must respond to NOAA Fisheries. The response must include a description of measures proposed by the agency to avoid, mitigate, or offset the impact of the activity on EFH.

The FERC proposes to consolidate EFH consultations for the proposed project with the interagency coordination procedures required under NEPA. Therefore, the FERC is requesting consideration of this draft EIS/EIR as the FERC's EFH Assessment for the proposed project. A discussion of EFH for the managed species in the region (i.e., coastal pelagic and Pacific groundfish species) and control measures and management practices that would mitigate potential EFH impacts is presented below.

Managed Species in Long Beach Harbor

Consultation with NOAA Fisheries identified the proposed project area as designated EFH for the Coastal Pelagics and Pacific Groundfish Management Plans. Fourteen of the 86 species managed under these two plans are known to occur in Long Beach Harbor and could be affected by the proposed project (see table 4.4.3-1).

Amendment 8 to the Northern Anchovy Fishery Management Plan defines coastal pelagic species as those that occur in the water column and are not associated with the bottom. The four finfish managed

under this amendment and potentially affected by the proposed project include: northern anchovy, Pacific sardine, Pacific (chub) mackerel, and jack mackerel (see table 4.4.3-1).

TABLE 4.4.3-1		
Managed Fisheries Potentially Affected by the Long Beach LNG Import Project		
Common Name	Scientific Name	Comments
Coastal Pelagics		
Northern Anchovy	<i>Engraulis mordax</i>	Abundant in harbor. Most common species in harbor; adults and larvae present.
Pacific Sardine	<i>Sardinops sagax</i>	Abundant in harbor. Predominantly adults present.
Pacific (chub) Mackerel	<i>Scomber japonicus</i>	Abundant in harbor. One of top 10 most common species in deeper portions of the harbor.
Jack Mackerel	<i>Trachurus symmetricus</i>	Abundant in harbor. One of top 10 most common species in deeper portions of the harbor.
Pacific Groundfish		
English Sole	<i>Pleuronectes vetulus</i>	Rare in harbor. Adults present.
Pacific Sanddab	<i>Citharichthys sordidus</i>	Uncommon in harbor. Adults present.
Leopard Shark	<i>Triakis semifasciata</i>	Species reportedly commonly taken by sport fishermen in harbor; rare from harbor beach seines. Adults present.
Bocaccio	<i>Sebastes paucispinis</i>	Uncommon to rare in harbor. Juveniles found in kelp around breakwater.
California Scorpionfish	<i>Scorpaena gutatta</i>	Common in harbor. Adults found in rock dikes and breakwater during the day, soft bottom at night.
Cabezon	<i>Scorpaenichthys marmoratus</i>	Common on hard substrates in harbor. Adults present.
California Skate	<i>Raja inornata</i>	Uncommon in harbor.
Lingcod	<i>Ophiodon elongates</i>	Rare in harbor, uncommon offshore.
Black Rockfish	<i>Sebastes melanops</i>	Uncommon in southern California.
Olive Rockfish	<i>Sebastes serranoides</i>	Common in harbor. Juveniles found in kelp around breakwater.

Among the coastal pelagic species, the northern anchovy is the most abundant species in the Los Angeles and Long Beach Harbors, accounting for approximately 40 percent of the fish collected by otter trawl and 70 percent of the individuals collected in lampara nets (MEC, 2002). This species supports a commercial bait fishery in the harbor. The Pacific sardine, which comprises 4 percent of the pelagic fish collected in Long Beach Harbor, also supports a commercial bait fishery (MEC, 2002). The other two coastal pelagic species (Pacific mackerel and jack mackerel) are frequently encountered in the harbor but are not considered major components of the ichthyofauna. None of the coastal pelagic species is known to spawn in the harbor, but northern anchovy larvae are an important component of the ichthyoplankton (MEC, 2002). Little difference was observed in lampara fish catch between the Inner and Outer Harbor areas, indicating that pelagic schooling fish species range in high abundance throughout the harbor complex.

Amendment 11 to the Pacific Coast Groundfish Fishery Management Plan identifies 82 species of groundfish (defined as “fish species that live on or near the bottom, often called bottomfish”) that are found along the west coast of the United States. Ten of the 82 species are known to occur in the Los Angeles and Long Beach Harbors (see table 4.4.3-1).

Among the groundfish, the California scorpionfish is reportedly common in Long Beach Harbor. It is associated with rock substrates, such as dikes and breakwaters, and is rarely collected in nets, but night observations by divers suggest it is very abundant. The other nine species of managed groundfish that exist in the Los Angeles and Long Beach Harbors are rarely or infrequently collected in the project area (POLB, 2003a). None of the Pacific groundfish species is known to spawn in the harbor area.

Potential Impacts and Mitigation

Potential impacts on EFH for coastal pelagic and groundfish species include direct and indirect impacts on water quality and marine substrates from the reinforcement of the shoreline structures, dredging activities, and construction of the LNG ship berth and unloading facility. This could include disturbance or replacement of bottom substrates, turbidity caused by dredging, and introduction of chemical contaminants from construction and support vessels (see section 4.4.3.1). Additionally, operation of the facility could potentially impact EFH through accidental spills or leaks of hazardous materials, storm water runoff, or an LNG spill (see section 4.3.3.2).

Implementation of the control measures and management practices proposed by SES or required by the regulatory agencies would serve to avoid or minimize impacts on EFH from any of the construction or operation activities. These measures and practices include:

- minimizing temporary impacts associated with dredging through adherence to the measures included in the ACOE's section 404 permit and the RWQCB's WDR permit (see section 4.3.3.2);
- implementing the BMPs in the POLB's Dredge and Disposal Plan during dredging operations (see section 4.3.3.2);
- implementing SES' SWPPP to avoid or minimize the release of sediments into the West Basin during construction and operation of the LNG terminal (see section 4.2.2.2 and Appendix B);
- implementing the special precautions outlined in SES' Spill Procedure to reduce the potential for surface water contamination from hazardous materials (see section 4.3.3.2 and Appendix B);
- using the HDD construction method to install the natural gas and C₂ pipelines under the Cerritos Channel (see section 4.3.3.2);
- installing the C₂ pipeline on an existing pipe rack across the Dominguez Channel (see section 4.3.3.2); and
- immediately implementing measures to contain, collect, and cleanup an inadvertent release of drilling fluid as detailed in SES' HDD Plan (see section 4.3.3.2 and Appendix C).

Although disturbance of an estimated 11.9 acres of sea floor and the temporary resuspension of sediments into the water column during dredging activities could potentially adversely affect EFH (resulting in avoidance by adults and some loss of larval northern anchovy in the immediate vicinity of the dredging activity), implementation of the control measures and management practices listed above would serve to avoid or minimize impacts on EFH. Additionally, construction impacts would be temporary and turbidity levels would return to baseline conditions following construction. Therefore, the overall impacts of the proposed project on coastal pelagic and groundfish EFH would be less than significant and no additional mitigation measures would be necessary.

SES submitted information about the proposed project and potential impacts on EFH to NOAA Fisheries on November 25, 2003. NOAA Fisheries determined that activities associated with the proposed project would result in temporary and minor impacts on EFH and that the impacts would be

minimized by adherence to ACOE and RWQCB permit stipulations. Based on this EFH analysis, the FERC staff concurs with NOAA Fisheries and finds that construction and operation of the proposed project, with implementation of the measures and practices described above, would comply with the intent and degree of protection afforded to the species listed in table 4.4.3-1 and their designated EFH under the MSA.

4.4.4 Threatened and Endangered Species

Federal and state regulations protect a number of species that potentially occur in the project area. With assistance from SES, the Agency Staffs informally consulted with the FWS, NOAA Fisheries, and the CDFG to assess impacts on special status species. None of these agencies identified any particular concerns based on the description of the proposed project. Threatened and endangered species observed or that have the potential to occur in the proposed project area are listed in table 4.4.4-1 and discussed in detail below.

TABLE 4.4.4-1 Threatened and Endangered Species Observed or Possibly Occurring in the Long Beach LNG Import Project Area			
Common Name	Scientific Name	Status ^a	Observed or Possibly Expected
American Peregrine Falcon	<i>Falco peregrinus anatum</i>	SE	Nesting observed on Terminal Island periodically; uses trees near the project area as perches.
California Brown Pelican	<i>Pelecanus occidentalis californicus</i>	FE/SE	Forages in the West Basin.
California Least Tern	<i>Sterna antillarum browni</i>	FE/SE	Nests on Terminal Island; forages in the harbor.
Western Snowy Plover	<i>Charadrius alexandrinus nivosus</i>	FT/CSC	No recent nesting in the area; low potential for occurrence.
Green Sea Turtle	<i>Chelonia mydas</i>	FT	Possible use of the harbor.
Olive Ridley Sea Turtle	<i>Lepidochelys olivacea</i>	FT	Possible use of the harbor.
Loggerhead Sea Turtle	<i>Caretta caretta</i>	FT	Possible use of the harbor.
Leatherback Sea Turtle	<i>Dermochelys coriacea</i>	FE	Possible use of the harbor.
^a Status: U.S. Fish and Wildlife Service and NOAA Fisheries: FE = Endangered. In danger of becoming extinct throughout all or a significant portion of its range. FT = Threatened. Likely to become endangered in the foreseeable future in the absence of special protection. California Department of Fish and Game: SE = Endangered. In serious danger of becoming extinct throughout all or a significant portion of its range. CSC = California Species of Special Concern. Sufficient information exists that warrants concern over species status and may warrant future listing as threatened or endangered.			

4.4.4.1 Federal Threatened and Endangered Species

Section 7 of the ESA, as amended, requires a federal agency to ensure that any action authorized, funded, or carried out by the agency does not jeopardize the continued existence of a federally listed endangered or threatened species, or result in the destruction or adverse modification of the designated critical habitat of a federally listed species. The federal action agencies are required to consult with the FWS and NOAA Fisheries to determine whether any federally listed or proposed listed endangered or threatened species or any of their designated critical habitats are found in the vicinity of the proposed project, and to determine the proposed action's potential effects on those species or critical habitats. Seven species listed as federally threatened or endangered potentially occur in the project area. The California brown pelican, California least tern, and leatherback sea turtle are federally listed endangered species and the western snowy plover, green sea turtle, olive Ridley sea turtle, and loggerhead sea turtle

are federally listed threatened species. Both the FWS and NOAA Fisheries provided comments indicating that federally listed threatened or endangered species would not likely be adversely affected by the proposed project (Fancher, 2004; TRC Environmental Corporation, 2003). The FERC staff concurs with these determinations. The listed species that potentially occur in the project area are discussed below.

California Brown Pelican

The California brown pelican is a coastal bird that commonly occurs within 12 miles of shore, but is also observed up to 100 miles from the coast. It feeds mostly in shallow estuarine waters on northern anchovy and other small fish, as well as crustaceans and carrion. The range of the California brown pelican includes the west coast of North America as far north as British Columbia. This species makes extensive use of roosting sites such as rocky cliffs, jetties, sand spits, offshore sand bars, mudflats, and islets. The California brown pelican nests along the Pacific coast in southern California from the Channel Islands southward along the Baja California coast and in the Gulf of California to coastal southern Mexico. Although the California brown pelican does not nest within the Los Angeles and Long Beach Harbors, this area, particularly the outer breakwater and open water, provides roosting and feeding habitat (MEC, 2002). A majority of the pelicans observed in the area were roosting along the riprap of the outer breakwater.

California brown pelicans use the docks and shoreline riprap of the West and Southeast Basins and the Outer Harbor to rest, but do not rely on these areas for breeding, nesting, or feeding. Construction and operation of the proposed project could potentially disturb this species through temporary loss or degradation of foraging habitat, temporary turbidity in the marine waters, and disruptive noise. However, their continued abundance in the harbor indicates that California brown pelicans have generally acclimated to POLB operations, including pile-driving, construction, and dredging activities, all of which occur frequently in the harbor. Consequently, construction and operation of the Long Beach LNG Import Project would not likely adversely affect the California brown pelican.

California Least Tern

The California least tern inhabits seacoasts, beaches, bays, estuaries, lagoons, lakes, and rivers, and rests on sandy beaches, mudflats, and salt-pond dikes. This species typically preys on northern anchovy, topsmelt, killifish, mosquitofish, shiner surfperch, and mudflat gobies in areas with water less than 20 feet deep. This species usually occurs singly or in small loose groups when it is not breeding, but migrates in larger flocks. The California least tern's nesting range is along the Pacific coast from southern Baja California to San Francisco Bay. Least terns usually arrive in California in April and depart in August. They nest in colonies near the coast on undisturbed, bare, or sparsely vegetated flat substrates with loose, sandy substrate. Development and recreational use have largely eliminated the natural nesting habitats of this species. Typical nesting sites are now on isolated or specially protected sand beaches or on natural or artificial open areas in remnant coastal wetlands, and are typically located near estuaries, bays, or harbors where small fish are abundant. California least terns have traditionally foraged in the shallow water habitat west of the Navy Mole in Long Beach Harbor.

The California least tern may occasionally fly over the project area when foraging. However, area waters are not designated as essential foraging habitat. Construction and operation of the proposed project could potentially disturb this species through temporary loss or degradation of foraging habitat, temporary turbidity in the marine waters, and disruptive noise. However, the project would not result in the permanent loss or degradation of existing habitats or significantly increase existing noise levels during construction and operation. Consequently, construction and operation of the Long Beach LNG Import Project would not likely adversely affect the California least tern.

Western Snowy Plover

The western snowy plover inhabits beaches; dry mud or salt flats; and sandy shores of rivers, lakes, and ponds. Outside of the breeding season, individuals are usually found on islands and on the coast from Oregon south to Guatemala. The western snowy plover nests along the Pacific coast north to southern Washington and south to Baja California, being most numerous from San Francisco Bay south. This species nests on undisturbed, flat ground on broad open beaches or salt or dry mud flats where vegetation is sparse or absent. Nesting occurs between April 1 and September 15. Western snowy plovers forage primarily on the wet sand at the beach-surf interface, feeding on small crustaceans, marine worms, insects, and amphipods. Due to the lack of suitable nesting and foraging habitat, there is low potential for the western snowy plover to occur in the project area. Therefore, there would be no effect on the western snowy plover from construction and operation of the Long Beach LNG Import Project.

Sea Turtles

Four species of sea turtles potentially occur in or near the entrances to Long Beach Harbor, including the green, olive Ridley, loggerhead, and leatherback sea turtles. Green and olive Ridley sea turtles inhabit tropical regions of the Pacific, Indian, and Atlantic Oceans; the loggerhead sea turtle is found in temperate and subtropical waters throughout most of the world; and the leatherback sea turtle is primarily found in the open ocean, but occasionally is seen in inshore waters. In the eastern North Pacific, green turtles have been sighted from Baja California to southern Alaska. Olive Ridley sea turtles range from the west coast of California south to Chile. Loggerhead sea turtles inhabit an enormous range from north to south but are rare or absent far from mainland shores. Leatherback sea turtles range as far north as Alaska and as far south as the southern tip of Africa. All four sea turtle species nest on beaches and lay eggs multiple times per nesting season. However, none of the species are known to nest at or near the proposed project area due to the lack of suitable nesting habitat. These sea turtle species are highly migratory and utilize coastal waters for foraging and migratory habitat during certain stages of their life history.

Construction would not likely affect sea turtles because of their rarity at the project site. While entering and exiting Long Beach Harbor, the LNG ship traffic necessary for operation of the proposed project could potentially disturb threatened and endangered sea turtle species in the immediate area. However, sea turtles are only infrequently observed near the harbors in San Pedro Bay. Furthermore, the LNG ship traffic for this project would represent only a 4 percent increase in ship traffic levels and, therefore, would not significantly increase the ship traffic that already exists in Long Beach Harbor (see section 4.7.3.2). Consequently, there would be no effect on the green, olive Ridley, loggerhead, or leatherback sea turtle species from the Long Beach LNG Import Project.

4.4.4.2 State Threatened and Endangered Species

California has its own Endangered Species Act (CESA) that protects and promotes the recovery of state-listed endangered and threatened species. Similar to the ESA, the CESA requires that state agencies consult with the CDFG to ensure that actions are not likely to jeopardize the continued existence of any endangered or threatened species or result in destruction or adverse modification of essential habitat. The FERC and the POLB have consulted with the CDFG and included an assessment of potential impacts on state-listed endangered or threatened species in this draft EIS/EIR. Three state-listed endangered species, the American peregrine falcon, the California brown pelican, and the California least tern, have been identified as potentially occurring in the proposed project area. The California brown pelican and the California least tern are also federally listed species and are discussed in section 4.4.4.1. The American peregrine falcon is discussed below.

American Peregrine Falcon

The range of the American peregrine falcon includes most of California, except deserts, during its migrations and in the winter. American peregrine falcons are primarily found near large bodies of water where they feed on water birds. The California breeding range, which has been expanding, now includes the Channel Islands, the coast of southern and central California, and inland and northern coastal mountains. Nesting sites are typically on ledges of large cliff faces, but some pairs nest on city buildings and bridges. Nesting and wintering habitats are varied and can include the following: wetlands, woodlands, other forested habitats, cities, agricultural areas, and coastal habitats. American peregrine falcons forage regularly in Los Angeles and Long Beach Harbors, and several pairs of peregrine falcons regularly nest within the ports of Los Angeles and Long Beach and their vicinity. This presence indicates that the birds are acclimated to construction and operation activities in the port complex.

Construction and operation of the Long Beach LNG Import Project could disturb the American peregrine falcon through temporary loss or degradation of foraging habitat and disruptive noise from construction and operation of the project facilities. However, peregrine falcons in the project area have become acclimated to POLB operations, including construction and dredging activities as evidenced by their continued use of the local bridges for nesting. In addition, the proposed project would not result in the permanent loss or degradation of existing foraging habitat or significantly increase existing noise levels during construction and operation. Therefore, impacts on the American peregrine falcon would be less than significant.

4.5 LAND USE, RECREATION, AND VISUAL RESOURCES

4.5.1 Significance Criteria

Impacts on land use would be considered significant if project construction or operation would:

- be inconsistent with existing zoning regulations;
- result in activities conflicting with existing surrounding uses; or
- create conflicts between the project and state goals and objectives of the PMP, as amended (see section 1.4).

Impacts on recreation would be considered significant if project construction or operation would:

- threaten the viability of a recreational resource, prohibit access to recreational resources, or cause termination of a recreational use.

Impacts on visual resources would be considered significant if project construction or operation would:

- dominate the viewshed from sensitive locations and change the character of the landscape both in terms of physical characteristics and land uses;
- block or alter an important/valued view for sensitive viewers or have a substantial, adverse effect on a scenic vista; or
- create a new source of substantial light or glare that would adversely affect day or nighttime views in the area.

4.5.2 Land Use and Ownership

The Long Beach LNG Import Project would be located in a highly urbanized area of Los Angeles County, California. The LNG terminal facilities, the temporary construction laydown and worker parking area, a portion of the pipeline facilities, and the electric distribution facilities would be located within the boundaries of the POLB. The pipeline facilities would also be located within the Cities of Long Beach, Los Angeles, and Carson. A total of 88.0 acres of land would be affected during construction of the Long Beach LNG Import Project (56.9 acres for the LNG terminal facilities, 30.1 acres for the pipeline facilities, and 1.0 acre for the electric distribution facilities). Of the 88.0 acres of land affected by construction of the project, 37.0 acres would be permanently affected during operation of the project facilities (32.1 acres associated with the LNG terminal, 3.9 acres associated with the pipelines, and 1.0 acre associated with the electric distribution facilities).

4.5.2.1 LNG Terminal Facilities

The LNG terminal would be located on a portion of Pier T, designated Berth T-126 within Terminal Island Planning District 4 of the POLB. Terminal Island is a manmade island that has been constructed and expanded since the early 1900s through various reclamation projects. The island is composed entirely of fill soils that range in thickness from 45 to 55 feet. Permitted uses within Terminal Island Planning District 4 include primary POLB facilities, hazardous cargo facilities, Port-related uses, navigation, ancillary POLB facilities, federal uses, oil production, and utilities.

The LNG terminal site would occupy about 25 acres of the 288 acres associated with Pier T. As discussed in section 1.2.2, SES would have to obtain a lease from the BHC to build and operate the project.

Pier T is located within a former United States naval complex that included the Long Beach Naval Station, Navy Mole, and Naval Shipyard. The Naval Station and Navy Mole were closed in 1994 and the Naval Shipyard was closed about 3 years later. The 25-acre site is currently paved with concrete and/or asphalt and includes two abandoned buildings. In recent years one of the buildings has been used by the City of Long Beach to house firefighting equipment and for other miscellaneous uses. The POLB would demolish the buildings on the site and remove the pavement prior to SES' initiation of activities associated with the proposed project (see section 2.1.1).

The entire 25-acre site would be used for construction and operation of the LNG terminal facilities. In addition to the 25-acre site on land, a 200-foot-wide by 1,150-foot-long area would be dredged for the ship berth and unloading facility adjacent to Pier T. These dredging activities would result in about 5.3 acres of disturbance to the sea floor within the West Basin. Of these 5.3 acres, the ship berth and unloading facility would permanently occupy about 0.5 acre. Two additional areas along the western and southern edges of Pier T would be dredged to reinforce the shoreline structures. These areas would be 150 feet wide by 250 feet long and 180 feet wide by 1,400 feet long for a total disturbance to the sea floor of 6.6 acres during both construction and operation. However, no new land would be created.

A 16-acre site located on Pier T about 1 mile northwest of the LNG terminal site would be used for temporary construction laydown, staging, storage, and worker parking. The laydown area is graveled and includes a rail spur along the northern border of the site that extends to the LNG terminal site. Although the laydown area is located within the City of Los Angeles, the parcel is owned by the POLB.

In addition to the temporary laydown area on land, construction materials would be shipped by barge to the LNG terminal site. An estimated four to six barges would be moored around the LNG terminal site at various times during construction of the LNG storage tanks. These barges would provide about 4 acres of additional temporary extra workspace.

Table 4.5.2-1 summarizes the acres of each land use that would be affected by construction and operation of the proposed LNG terminal facilities.

TABLE 4.5.2-1						
Area (Acres) Affected by Construction and Operation of the Proposed LNG Terminal						
Facility	Industrial ^a		Open Water ^b		Total	
	Const.	Oper.	Const.	Oper.	Const.	Oper.
LNG Terminal Site	25.0	25.0	0.0	0.0	25.0	25.0
Ship Berth and Unloading Facility	0.0	0.0	5.3	0.5	5.3	0.5
Reinforcement of the Shoreline Structures	0.0	0.0	6.6	6.6	6.6	6.6
Temporary Laydown and Worker Parking Area	16.0	0.0	0.0	0.0	16.0	0.0
Temporary Barges	0.0	0.0	4.0	0.0	4.0	0.0
Total	41.0	25.0	15.9	7.1	56.9	32.1
^a Industrial land includes previously developed areas associated with the POLB. ^b Open water includes those portions of the West Basin disturbed by construction and operation of the ship berth and unloading facility and dredging to reinforce the shoreline structures.						

All of the land and marine uses immediately adjacent to the LNG terminal facilities are associated with the industrial activities of the ports of Long Beach and Los Angeles. Surrounding land uses on Pier T include the containerized cargo facility of Total Terminals Inc./Hanjin Shipping Company (TTI/Hanjin), the liquid bulk facility of BP ARCO (crude oil and petroleum products), the breakbulk facilities of the Pacific Coast Recycling Company (metal and steel recycling), and the lumber and lumber products facilities of the Fremont Forest Group Corporation and the Weyerhaeuser Company. The TTI/Hanjin facilities occupy most of Pier T along Ocean Boulevard. Generalized land uses within 2 miles of the LNG terminal site include a mix of industrial and commercial interspersed with high density residential (see section 4.5.3). Operation of the LNG terminal facilities is not expected to interfere with any activities on adjacent berths.

The LNG terminal would be an industrial use that generally conforms to the overall goals of the current PMP, local zoning ordinances, and relevant regional plans and would be consistent with existing surrounding uses. However, an amendment to the PMP would be necessary to accommodate the LNG facility because LNG is not an expressly identified “hazardous cargo” as permitted within Terminal Island Planning District 4 (see section 1.4.3).

4.5.2.2 Natural Gas and C₂ Pipelines and Associated Aboveground Facilities

The proposed natural gas pipeline would be 2.3 miles long and would be constructed and operated by SES. A total of about 1.6 miles of the pipeline would be located within the POLB (0.9 mile in the Terminal Island Planning District 4 and 0.7 mile in the Northwest Harbor Planning District). The remaining 0.7 mile would be within the boundaries of the City of Los Angeles. The entire pipeline route would cross heavily disturbed, industrialized areas associated with the POLB and surrounding areas. The majority of the land crossed by the pipeline is owned by the POLB (1.7 miles or 74 percent). The remaining 0.6 mile of land (26 percent) is privately owned. The privately owned parcels consist of about 1,000 feet (0.2 mile) in the Long Beach Generating Station (formerly the Edison Power Station) and about 2,400 feet (0.4 mile) in SCE’s transmission line right-of-way. In general, the entire pipeline route would be located adjacent to or within existing utility or road rights-of-way.

The proposed C₂ pipeline would be 4.6 miles long and would be constructed and operated by ConocoPhillips. The first 2.3 miles of the pipeline would follow the same route as the natural gas pipeline. The remaining 2.3 miles would be located within the Cities of Los Angeles (1.4 miles) and Carson (0.9 mile). The majority of the pipeline route would be located adjacent to or within existing utilities and there are no schools or day care facilities in the area. Within the City of Los Angeles, the pipeline would cross land owned by the POLA in the Wilmington area. As discussed in section 1.4.5, the POLA indicated that it is currently investigating the feasibility of developing an ICTF on a portion of the property crossed by the proposed C₂ pipeline. The POLA also stated that any pipeline constructed within an ICTF would need to be designed to handle railroad loads. SES would need to acquire the necessary right-of-way permits from the POLA in order to cross this property and those permits would specify construction standards.

For the portion of the pipelines on private land, SES and/or ConocoPhillips would need to acquire an easement or property to construct and operate the proposed facilities. The easement would convey both temporary (for construction) and permanent rights-of-way and give the right to construct, operate, and maintain the pipeline facilities. An easement agreement between a company and a landowner typically specifies compensation for losses resulting from construction, including losses of non-renewable and other resources, damages to property during construction, and restrictions on existing uses that would not be permitted on the permanent right-of-way after construction.

Land use impacts associated with the pipelines would include the disturbance of existing land uses within the construction right-of-way during construction and retention of a new permanent right-of-way for operation of the pipelines. Of the 2.3 miles associated with the natural gas pipeline, 1.4 miles (61 percent) would be constructed using a 50-foot-wide construction right-of-way. The remaining 0.9 mile would be constructed using the HDD method (0.5 mile or 22 percent) or using a 30-foot-wide construction right-of-way (0.4 mile or 17 percent). Following construction, a 4-foot-wide permanent right-of-way would be retained for operation and maintenance of the pipeline. Similarly, construction of the C₂ pipeline would require a 30- to 50-foot-wide construction right-of-way and an approximately 4-foot-wide permanent right-of-way. The C₂ pipeline would be installed across the Dominguez Channel on an existing pipe bridge.

In addition to the construction right-of-way, two temporary extra workspaces would be used to facilitate the HDD crossing of the Cerritos Channel associated with both the proposed natural gas and C₂ pipelines. A 200-foot by 200-foot temporary extra workspace would be used at the HDD entry location at MP 0.6 and a 100-foot by 100-foot temporary extra workspace would be used at the HDD exit location at MP 1.1. No new access roads would be required and pipe would be stored offsite or in the temporary construction laydown area associated with the LNG terminal. There are no residences closer than 500 feet from either of the pipeline routes.

The aboveground facilities associated with the natural gas pipeline would include a meter station, odorization system, and pig launcher at the beginning of the pipeline route (MP 0.0) and a pig receiver at the end of the pipeline route (MP 2.3). The meter station, odorization system, and pig launcher would be located on a 150-foot by 150-foot site located within the 25-acre LNG terminal facility site. The pig receiver would be constructed on a 75-foot by 150-foot site in an industrial area at the end of the pipeline where it interconnects with the SoCal Gas system.

The aboveground facilities associated with the C₂ pipeline would include a meter station and pig launcher at the beginning of the pipeline route (MP 0.0) and a pig receiver at the end of the pipeline route (MP 4.6). The meter station and pig launcher would be located adjacent to the meter station and pig launcher associated with the natural gas pipeline within the 150-foot by 150-foot site at the LNG terminal facility. The pig receiver would be constructed on a 100-foot by 150-foot fenced site within the LARC.

Construction of the pipeline facilities would affect a total of about 30.1 acres of land, consisting of 10.9 acres for the facilities associated with the natural gas pipeline and 19.2 acres for the facilities associated with the C₂ pipeline. Industrial land would be the only land use affected by construction of the pipeline facilities. An easement would exist across the Cerritos Channel but the open water would not be affected during operation of the pipelines. Table 4.5.2-2 summarizes the acres of each land use that would be affected by construction and operation of the proposed pipeline facilities.

Of the 30.1 acres of land affected by construction of the pipeline facilities, about 1.4 acres would be retained for operation of the natural gas pipeline facilities and 2.5 acres would be retained for operation of the C₂ pipeline facilities. The land retained as permanent right-of-way for the pipelines would be allowed to revert to former use; however, certain activities such as the construction of aboveground structures would be prohibited within the permanent right-of-way. The pig launcher and receiver sites would be fenced and precluded from future development; however, each would be located within existing or proposed industrial facilities. The remaining 26.2 acres used for temporary construction right-of-way and temporary extra workspace would be allowed to revert to prior uses following construction with no restrictions.

The pipeline facilities would be an industrial/utility use that is consistent with existing surrounding uses and conforms to the overall goals of the current PMP, local zoning ordinances, and

relevant regional plans. As a result, impacts on land use associated with the pipeline facilities would be less than significant.

TABLE 4.5.2-2						
Area (Acres) Affected by Construction and Operation of the Proposed Pipeline Facilities						
Facility	Industrial ^a		Open Water ^b		Total	
	Const.	Oper.	Const.	Oper.	Const.	Oper.
Natural Gas Pipeline Facilities						
Pipeline Right-of-Way ^c	9.5	0.8	0.0 ^d	0.3 ^d	9.5	1.1
Temporary Extra Workspace						
HDD Entry Workspace	0.9	0.0	0.0	0.0	0.9	0.0
HDD Exit Workspace	0.2	0.0	0.0	0.0	0.2	0.0
Temporary Extra Workspace Subtotal	1.1	0.0	0.0	0.0	1.1	0.0
Aboveground Facilities						
Pig Launcher ^e	0.0	0.0	0.0	0.0	0.0	0.0
Pig Receiver	0.3	0.3	0.0	0.0	0.3	0.3
Aboveground Facilities Subtotal	0.3	0.3	0.0	0.0	0.3	0.3
Natural Gas Pipeline Facilities Subtotal	10.9	1.1	0.0	0.3	10.9	1.4
C₂ Pipeline Facilities ^f						
Pipeline Right-of-Way ^g	17.8	1.9	0.0 ^d	0.3 ^d	17.8	2.2
Temporary Extra Workspace ^h						
HDD Entry Workspace	0.9	0.0	0.0	0.0	0.9	0.0
HDD Exit Workspace	0.2	0.0	0.0	0.0	0.2	0.0
Temporary Extra Workspace Subtotal	1.1	0.0	0.0	0.0	1.1	0.0
Aboveground Facilities						
Pig Launcher ^e	0.0	0.0	0.0	0.0	0.0	0.0
Pig Receiver	0.3	0.3	0.0	0.0	0.3	0.3
Aboveground Facilities Subtotal	0.3	0.3	0.0	0.0	0.3	0.3
C ₂ Pipeline Facilities Subtotal	19.2	2.2	0.0	0.3	19.2	2.5
Total	30.1	3.3	0.0	0.6	30.1	3.9
^a Industrial land includes previously developed areas associated with the POLB. ^b Open water includes the crossings of the Cerritos Channel. ^c Based on a 50-foot-wide construction right-of-way from MPs 0.0 to 0.6 and MPs 1.5 to 2.3 and a 30-foot-wide construction right-of-way from MPs 1.1 to 1.5. Operation acreage based on a 4-foot-wide permanent right-of-way in all areas. ^d The pipeline would be installed across the Cerritos Channel (MPs 0.6 to 1.1) using the horizontal directional drill construction method (see sections 2.3.2 and 4.3.3.2). As a result, no impacts on open water would occur during construction. A 4-foot-wide permanent easement would be obtained across the channel for operation of the pipeline; however, no impacts on open water would occur. ^e The pig launcher would be located within the proposed LNG terminal facility. No additional land would be required. ^f The first 2.3 miles of the C ₂ pipeline would follow the same route as the proposed natural gas pipeline; however, the two pipelines would be constructed at different times. Therefore, the acreage presented includes the entire 4.6 miles of the C ₂ pipeline. ^g Based on a 30- to 50-foot-wide construction right-of-way and a 4-foot-wide permanent right-of-way. ^h The same workspace utilized for the HDD of the Cerritos Channel associated with the natural gas pipeline would be used for the C ₂ pipeline.						

4.5.2.3 Electric Distribution Facilities

SCE would install 0.8 mile of electric distribution lines to provide 66 kV service to a new substation (the Sound Substation) that would be located within the LNG terminal boundaries at the northern end of the site. Approximately 4,160 circuit feet of overhead 954 spaced aerial cable (SAC) on 10 tubular steel poles would be installed. The first 830-foot-long extension would connect along the APL

Substation tap along Pier T Avenue, going westerly to the new Sound Substation, and requires the installation of one new pole switch. This extension would require about 0.2 acre of land for construction and operation. The remaining 3,300-foot-long extension would connect along the Dock Substation tap along Seaside/Ocean Boulevard, going southerly to the new Sound Substation, and requires the installation of one new pole switch. About 0.4 acre of land would be required for construction and operation of this extension.

In addition, the SES project load would require upgrading the 66 kV line between the Long Beach Generating Station and the formed tap point. This upgrade would require the replacement of 2,100 circuit feet of existing 653 KCMIL aluminum steel-reinforced conductor with new 954 SAC conductor. In order to support the heavier conductors, five wood poles along Pier T Avenue to the Sound Substation tap point would be reframed. These activities would require about 0.3 acre of land during construction and operation. It would also be necessary to relocate one existing pole-mounted switch to an existing wood pole before the Sound Substation tap point and reframe one additional wood pole in the APL Substation leg to accommodate the relocated pole-mounted switch. These poles would affect a total of 0.1 acre of land during construction and operation.

In total, construction and operation of the electric distribution facilities would affect about 1.0 acre of industrial land. The electric distribution facilities would be an industrial/utility use that is consistent with existing surrounding uses and conforms to the overall goals of the current PMP, local zoning ordinances, and relevant regional plans. As a result, impacts on land use associated with these facilities would be less than significant.

4.5.3 Existing Residences and Planned Developments

All of the land and marine uses immediately adjacent to and within 1 mile of the proposed project facilities are associated with the industrial activities of the ports of Long Beach and Los Angeles or the Cities of Long Beach, Los Angeles, and Carson. No permanent residences are located within the POLB or POLA. Generalized land uses between 1.0 and 2.0 miles from the LNG terminal facilities include a mix of industrial and commercial land interspersed with high density residential land. The closest potential residences are in a recreational vehicle park about 1.3 miles east-northeast of the LNG terminal site and possibly live-aboard boats at two marinas in the East Basin of the Cerritos Channel between 1.2 and 1.6 miles northwest of the LNG terminal. These distances are well outside the thermal and dispersion exclusion zones for the site (see section 4.11.5).

The project would not conflict with any approved residential or commercial development plans; however, there are several reasonably foreseeable or planned industrial projects that have been identified by the POLB within the Port that may occur within the same time period as construction of the proposed project. In addition, the POLA indicated in a comment letter that it is currently investigating the feasibility of developing an ICTF on a portion of property crossed by the proposed C₂ pipeline. Section 4.12 includes a description of these planned projects and an analysis of potential cumulative effects when considered in conjunction with the Long Beach LNG Import Project.

4.5.4 Hazardous Waste Sites

A search of available environmental records was conducted to identify hazardous waste sites in the vicinity of the proposed project facilities. The Long Beach Naval Shipyard and Station are listed as hazardous waste sites. The Navy also documented soil contamination in the area during closure of its Long Beach Complex (see section 4.2.2.1). Hazardous waste sites within 0.25 mile of the pipeline routes and electric distribution facilities are listed in table 4.5.4-1. Because none of these sites would be crossed by the proposed facilities, Phase I Environmental Assessments were not conducted.

TABLE 4.5.4-1

Listed Hazardous Waste Sites Within 0.25 Mile of the Long Beach LNG Import Project Facilities

Facility/Location	Database ^a	Distance and Direction from the Pipeline(s)
Natural Gas Pipeline and C₂ Pipeline (MPs 0.0 to 2.3)		
Ship Cape Inscription No. 56949, Naval Station Mole Pier	RCRIS, FINDS	1,070 feet south
Freemont Forest Products, 800 Pier T	UST	1,203 feet southeast
Ship Cape Isabel No. 577636, Naval Station Mole Pier	RCRIS, FINDS	954 feet southeast
Tidelands Oil Production, 552 Pier T	CHMIRS, FINDS	599 feet east
SGL Carbon Composites Inc., HITC, 415 Pier T Avenue	RCRIS, FINDS	809 feet east
Pacific Coast Recycling, Inc., 482 Pier T Avenue, Berth 11	RCRIS, FINDS	809 feet east
Pier E Naval Complex	CHMIRS	217 feet east
300 Skipjack Road	RCRIS	217 feet east
Long Beach Naval Shipyard	NOTIFY 65	181 feet west
300 Pier E Avenue, Berth 121	RCRIS	181 feet west
Weyerhaeuser Company	UST	786 feet east
Arco Marine Terminal	UST	786 feet east
BP Berth 121, 300 Pier T Avenue	RCRIS, FINDS	786 feet east
Seaside at Skipjack	RCRIS	258 feet west
2600 Seaside Blvd.	CHMIRS	545 feet east
2701 W. Seaside Blvd.	RCRIS	545 feet east
2675 Seaside Blvd.	RCRIS	545 feet east
Long Beach Naval Station	CERLIS, RCRIS-SQG	545 feet east
Long Beach Generating Station, 2665 Seaside Blvd.	CORTESE, LUST, CHMIRS, HIST, UST, EMI	991 feet east
1939 Edison Way	UST	424 feet east
2410 Pier B Street	CHMIRS	291 feet east
BP Wilmington Calciner	RCRIS, CHMIRS	963 feet east
Big J Tire, 2603 E. Anaheim Street	FINDS	719 feet west
Waterman Supply Co., Inc., 2821 E. Anaheim Street	CERCLIS, FINDS	336 feet west
Southern California Gas Co., Anaheim/Hopson	Unknown	132 feet east
George Auto Wrecking, 819 N. Foote Avenue	CERCLIS, FINDS	444 feet west
Apple Auto Dismantling, 2701 E. Anaheim Street	CERCLIS	444 feet west
Port of Long Beach, 3001 W. Anaheim Street	Unknown	202 feet east
2442 E. Anaheim Street	CHMIRS	1,514 feet west
BP Wilmington Calciner, 1775 Carrack Avenue	RCRIS	1,514 feet west
Ace Roll Off Rubbish Service, 2521 E. I Street	RCRIS	1,514 feet west
Roger R. Goldsmith Truck Vacuum, 903 MacDonough Avenue	RCRIS	1,514 feet west
Moreco, 912 MacDonough Avenue	RCRIS	1,514 feet west
BKK Corp. Wilmington Transfer Station, 3031 E. I Street	RCRIS	1,514 feet west
Debris lot, 926 MacDonough Avenue	CERCLIS-NFRAP	1,514 feet west
Azteca Auto Dismantling, 910 N. Foote Avenue	CERCLIS, FINDS	238 feet west
E&G Auto Dismantling, 902 N. Foote Avenue	CERCLIS, FINDS	238 feet west
Intersection of I Street and Paul Jones Street	CHMIRS	961 feet east
C₂ Pipeline (MPs 2.3 to 4.6)		
916 Farragut Avenue	RCRIS	77 feet west
Petroleum Sediment Disposal, 923 N. Farragut Avenue	RCRIS, FINDS	77 feet west
Chico's Auto Wrecking, 926 N. Farragut Avenue	CERCLIS, FINDS	77 feet west
Jerren Marine/Triple Transport, 3030 E. I Street	FINDS	580 feet east
Falcon Refuse Center, 3031 E. I Street	CHMIRS, CORTESE, NOTIFY 65, LUST, BEP	580 feet east
RC Baxter JR, Inc., 1000 Ushing Avenue	RCRIS, FINDS	549 feet west

TABLE 4.5.4-1 (cont'd)

Listed Hazardous Waste Sites Within 0.25 Mile of the Long Beach LNG Import Project Facilities		
Facility/Location	Database ^a	Distance and Direction from the Pipeline(s)
Concrete Coating and Restoration, 1003 N. Foote Avenue	FINDS	72 feet west
Enviro Ecology, 1001 N. Foote Avenue	CERCLIS, FINDS	72 feet west
Acta South; 1002, 1008, 1033, and 1044 Farragut Avenue	CASLIC, CERCLIS, FINDS	72 feet west
California Sulphur Co., 2509 E. Grant Street	RCRIS, LUST, FINDS	824 feet west
California Carbon, 2825 E. Grant Street	CERCLIS-NFRAP, WMUDS/SWAT	426 feet east
2400 East Pacific Coast Highway	RCRIS	64 feet east
Union Carbide Corp./Praxair Inc. Plant 861, 2300-2301 E. Pacific Coast Highway	CERCLIS-NFRAP, RCRIS, CHMIRS, LUST, CORTESE, UST, FINDS	482 feet west
2401 East Pacific Coast Highway	RCRIS	767 feet west
Valero Wilmington Asphalt Plant, 1651 Alameda Street	TSCA	1,297 feet south
Berwind Railway Service Co., 24899 S. Alameda Street	FINDS	327 feet west
Arco Products Co., 23800 S. Alameda Street	Unknown	238 feet west
23500 Alameda Street	RCRIS, CHMIRS	117 feet north

^a BEP:	Bond Expenditure Plan information comes from the California Department of Toxic Substances Control (DTSC), which is the State of California's equivalent to the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) program.
CASLIC:	California Spills, Leaks, Investigation, and Cleanup Program information comes from the California Regional Water Quality Control Board. The program deals with site investigation and corrective action involving sites not overseen by the Underground Storage Tank (UST) Program and the Well Investigation Program.
CERCLIS:	Comprehensive Environmental Response, Compensation, and Liability Information System contains data on potentially hazardous waste sites that have been reported to the U.S. Environmental Protection Agency by state, municipalities, private companies, and private persons pursuant to section 103 of the CERCLA.
CHMIRS:	California Hazardous Material Incident Report System contains information on reported hazardous material incidents (i.e., accidental releases or spills).
CORTESE:	Identifies public drinking water wells with detectable levels of contamination, hazardous substance sites selected for remedial action, sites with known toxic material identified through the abandoned site assessment program, sites with underground storage tanks having a reportable release, and all solid waste disposal facilities from which there is known migration.
FINDS:	The Facility Index System contains both facility information and pointers to other sources of information that contain more detail.
HAZNET:	These data are extracted from the copies of hazardous waste manifests received each year by the DTSC.
LUST:	The Leaking Underground Storage Tank Incident Reports contain an inventory of reported leaking underground storage tank incidents. The data come from the State Water Resources Control Board's Leaking Underground Storage Tank Information System.
NFRAP:	No further remedial action planned.
NOTIFY 65:	Notify 65 records contain facility notifications about any release that could impact drinking water and thereby expose the public to a potential health risk. The data come from the State Water Resources Control Board's Proposition 65 database.
RCRIS-SQG:	Resource Conservation and Recovery Information System includes selective information on sites that generate, transport, store, treat, and/or dispose of hazardous waste as defined by the Resource Conservation and Recovery Act (RCRA).
SWF/LF:	The Solid Waste Facilities/Landfill Sites records typically contain an inventory of solid waste disposal facilities or landfills in a particular state. The data come from the Integrated Waste Management Board's Solid Waste Information System database.
TSCA:	Toxic Substances Control Act.
UST:	The UST database contains registered USTs. USTs are regulated under Subtitle I of the RCRA.
WMUDS:	Waste Management Unit Database System.

Contaminated soils associated with these or other undocumented hazardous waste sites could be encountered during construction of the proposed facilities. As discussed in section 4.2.2.2, SES and the pipeline contractor(s) would develop procedures that would outline appropriate environmental site investigation and remediation activities and submit them to the appropriate agencies for approval before construction. Additional details on contaminated soils and sediments near the proposed facilities and on SES' proposed control measures are provided in sections 4.2.2 and 4.2.3, respectively.

4.5.5 Recreation and Special Interest Areas

San Pedro Bay and limited areas surrounding the POLB are used for a variety of onshore and offshore recreational activities. Offshore recreational activities are primarily associated with widespread use of Long Beach Harbor and San Pedro Bay by local residents and tourists on charter fishing and sightseeing boats. Recreational boats use the waterway to Queens Gate to access and exit the area and use San Pedro Bay inside the breakwater as a cruising area. High density commercial fishing does not occur within the approaches to the POLB or within the Port limits; however, as described in sections 4.4.3.1 and 4.4.3.3, Long Beach Harbor supports commercial bait fisheries for the northern anchovy and Pacific sardine. Onshore recreational facilities are primarily located at the Long Beach Shoreline Marina and Rainbow Harbor, which are more than 1.5 miles east of the proposed LNG terminal site.

Recreational boating and associated offshore recreational activities such as fishing are not allowed within the West Basin, which immediately surrounds the LNG terminal site. In general, fishing in the Los Angeles and Long Beach Harbors is discouraged because of heavy metal contamination of certain fish species. Outside the West Basin and Middle Harbor, San Pedro Bay experiences heavy recreational traffic with pleasure craft and small ships common within and around Queensway Bay. There are two marinas in the City of Long Beach within the vicinity of the proposed project: Rainbow Harbor/Rainbow Marina (1.7 miles east) and Long Beach Shoreline Marina (1.9 miles east). Rainbow Harbor has 12, 150-foot-long docks for commercial vessels, which predominantly provide charter services for fishing, whale watching, and sightseeing. There are also a number of vendors who rent boats and personal watercraft from Rainbow Harbor. Rainbow Marina has 103 slips for commercial and recreational vessels and a 200-foot-long dock for day guests. Long Beach Shoreline Marina has 1,844 slips for recreational boaters. Charter fishing boats and whale watching tours also depart from Queens Wharf, which is located 1.5 miles northeast of the LNG terminal site. There are also two marinas in the East Basin of the Cerritos Channel between 1.2 and 1.6 miles northwest of the LNG terminal site in the City of Los Angeles.

The closest onshore recreational facilities are located over 1 mile from the LNG terminal site. These facilities include the Queen Mary, the Long Beach Aquarium of the Pacific, Shoreline Village, Shoreline Park, Rainbow Harbor Esplanade, the Long Beach Shoreline Marina, and the Long Beach Convention and Entertainment Center. There are also a number of community and neighborhood parks in the area; however, there are no community or neighborhood parks within the POLB. Table 4.5.5-1 lists the recreational areas located within a 2-mile radius of the LNG terminal site.

TABLE 4.5.5-1			
Recreational Areas Within a 2-Mile Radius of the LNG Terminal Site			
Name of Facility	Type of Facility	Location	Distance and Direction from LNG Terminal Site
Los Angeles River Bikeway (LARIO)	Bike Path	East of Los Angeles County Flood Control Channel Long Beach	1.2 miles northeast
Cerritos Channel/East Basin Marinas	Commercial and Recreational Marinas	Cerritos Channel Los Angeles	1.2 to 1.6 miles northwest
Golden Shore RV Resort/ Marine Reserve	RV Park/Marine Reserve	101 Golden Avenue Long Beach	1.3 miles east
Catalina Landing	Events Arena/Cruise Terminal	320 Golden Shore Boulevard Long Beach	1.5 miles east
Cesar Chavez Park	Community Park	401 Golden Avenue Long Beach	1.5 miles northeast
Long Beach Aquarium of the Pacific	Aquarium	100 Aquarium Way Long Beach	1.5 miles east
Queens Wharf (Pier C, Berth 55)	Commercial Pier with Charter Boat Services	555 Pico Avenue Long Beach	1.5 miles northeast
Shoreline Park	Community Park	Aquarium Way and Shoreline Drive Long Beach	1.5 miles east
Victory Park	Green Space	Ocean Blvd. (Alamitos to Magnolia) Long Beach	1.6 miles northeast
Rainbow Harbor	Commercial Marina and Public Dock	429 N. Shoreline Drive Long Beach	1.7 miles east
Rainbow Harbor Esplanade	Shopping/Restaurants	429 N. Shoreline Drive Long Beach	1.7 miles east
Lincoln Park	Civic Center	Pacific and Broadway Long Beach	1.8 miles northeast
Shoreline Village/Marina	Shopping/Restaurants	429 Shoreline Village Drive Long Beach	1.8 miles east
Queen Mary	Hotel/Restaurant/Museum	1126 Queens Highway Long Beach	1.8 miles east
Carnival Cruise Terminal	Cruise Terminal	231 Windsor Way Long Beach	1.9 miles east
Long Beach Shoreline Marina	Recreational Marina	450 E. Shoreline Drive Long Beach	1.9 miles east
Drake Park	Neighborhood Park	951 Maine Avenue Long Beach	2.0 miles northeast
Long Beach Convention and Entertainment Center	Convention Center	300 E. Ocean Boulevard Long Beach	2.0 miles northeast
Rainbow Lagoon	Community Park	Pine and Shoreline Avenue Long Beach	2.0 miles east

Although the Long Beach area provides several opportunities for recreational activities, the immediate area surrounding the LNG terminal site, pipelines, and electric distribution facilities does not provide for recreational activities due to the industrial nature of the Port and the adjacent area to the north. Because the facilities associated with the Long Beach LNG Import Project would be located more than 1 mile from the nearest onshore recreational area, no impacts on these areas are anticipated during construction of the proposed facilities. The delivery of construction materials by barge to the LNG terminal site would not affect recreational use of San Pedro Bay because the traffic would be similar to current levels of ship traffic to and from the POLB and would occur within established shipping lanes and navigation areas. Construction of the Long Beach LNG Import Project would not threaten the viability of a recreational resource, prohibit access to recreational resources, or cause termination of a recreational use. As a result, impacts on recreational resources associated with construction of the project facilities would be less than significant.

Operation of the proposed project facilities would not affect onshore recreational sites because of the industrial nature of the POLB and the adjacent area to the north and the distance between the facilities and the nearest onshore recreational area. Minor delays to recreational boats could occur on days when an LNG ship arrives at the LNG terminal. SES estimates that LNG ships would arrive at the terminal up to 120 days per year. The Coast Guard, with the assistance of the POLB, would enforce a moving security zone for arriving LNG ships (see section 4.11.7.2). Other vessels, including recreational boats, would be prohibited within the security zone during the arrival of LNG ships. These effects would be temporary and minimized by the fact that the LNG ships would use established commercial shipping lanes that currently accommodate about 6,170 inward and outward vessel movements per year and the Coast Guard and HSC currently require ships entering and leaving the POLB to maintain a minimum separation distance of 500 yards (see section 4.7.3). Any impacts would also be minimized by the fact that recreational boating is not allowed within the West Basin. Accordingly, operation of the Long Beach LNG Import Project would not threaten the viability of a recreational resource, prohibit access to recreational resources, or cause termination of a recreational use. As a result, operation of the project facilities would not have a significant impact on recreation and special interest areas.

A scoping comment was received from the Los Angeles County Beaches & Harbor Department about potential impacts on Cabrillo Beach. Cabrillo Beach is located near the west end of the Los Angeles breakwater about 5 miles southwest of the proposed project facilities. Outer Cabrillo Beach is a popular recreational area that attracts more than 1 million visitors annually. Recreational activities in the area include beach going, surfing, fishing, boating, and windsurfing. There is also a marine museum that offers educational opportunities to visitors in the area. Because the project facilities would be located within a previously developed area of the POLB several miles from Cabrillo Beach, no impacts on recreational activities at Cabrillo Beach are anticipated. In addition, the overall visual assessment rating of the proposed facilities from Cabrillo Point (adjacent to Cabrillo Beach) was rated as low (see section 4.5.6). A discussion of safety-related issues associated with the Long Beach LNG Import Project is presented in section 4.11.

4.5.6 Visual Resources

As previously discussed, the LNG terminal site is currently unoccupied, with the exception of two abandoned buildings that would be demolished before construction of the LNG facilities. To the south and west the site is bordered by the West Basin. East of the site is a lumber storage area and the BP ARCO unloading terminal. To the north and west of the site is the TTI/Hanjin container cargo facility and Ocean Boulevard.

In the immediate vicinity and up to a 1-mile radius around the LNG terminal site, there are numerous container cargo facilities and associated cranes, piers, and storage tanks; a waste-to-energy plant; a satellite launching facility; the Long Beach Generating Station; and other POLB facilities. In addition to the Port infrastructure, the area between 1 and 2 miles from the LNG terminal site includes a portion of the City of Long Beach and its downtown area with commercial, recreational, and tourist facilities. Beyond the 2-mile and out to a 5-mile radius are the communities of San Pedro, Wilmington, and Signal Hill with high-density residential, commercial, and industrial land uses.

Topography in the project area is generally flat to gently sloping with little vegetation. Topography rises from essentially sea level to elevations in excess of 400 feet in San Pedro and in the vicinity of Signal Hill.

A Visual Impact Assessment was conducted to determine the potential impacts on visual resources associated with the LNG terminal facilities. The assessment conducted is in conformance with the POLB's protocols for assessing visual impacts. Representative viewing points (i.e., key observation points) were identified to a distance of about 5 miles from the LNG terminal site using aerial

photography, published literature, and field reconnaissance. The representative viewing points were identified to characterize the visibility of the proposed facility and its impact on potential viewers and the landscape in which it would be constructed and operated. The types of viewing points included in the assessment consisted of locations with concentrations of viewers such as on major roadways or in housing developments, visually sensitive land uses such as parks and recreation areas, culturally sensitive locations such as historic sites or areas to which citizens have an emotional attachment, and places designated as having scenic importance such as highways and overlooks. The potential visibility of the LNG terminal, the number of viewers, and the landscape quality were assessed from each of the viewing points, as described below.

- Viewers were considered by selecting assessment points with concentrations of viewers or locations that may be visually sensitive. The type of viewer, number of viewers, duration of view, competing tasks (e.g., driving), competing objects (e.g., buildings) and viewing experiences were all included in the assessment of impacts on viewers.
- Visibility of the LNG terminal was assessed by determining how much of the two LNG storage tanks and other facilities could be potentially viewed (i.e., dominance of the LNG storage tanks in the landscape), the distance of the viewer from the tanks and the scale from which it would be viewed, and other features in the landscape and their predominance relative to the dominant features. The LNG storage tanks, which would be the tallest of the terminal facilities, would be about 176 feet tall and 255 feet wide.
- Landscape quality was evaluated from each viewing point in terms of landform elements, vegetation, water, manmade features, and adjacent scenery.

The representative viewing points used in the Visual Impact Assessment are shown on figure 4.5.6-1. Because the LNG terminal site is located within the highly developed POLB, views from many locations would be either fully or partially screened by the numerous container cargo storage areas, buildings, cranes, ships, elevated highways, and other Port-related facilities. Visibility of the site is greatest from elevated locations such as bridges, taller buildings, distant hillside residential areas, and the open water of San Pedro Bay.

Table 4.5.6-1 summarizes the visual impact from several locations surrounding the proposed LNG terminal site. Visual simulations from the points with an overall moderate rating are shown on figures 4.5.6-2, 4.5.6-3, and 4.5.6-4. To address a scoping comment received from the Los Angeles County Beaches & Harbor Department, a visual simulation is also provided from Cabrillo Point (see figure 4.5.6-5).

Construction and operation of the LNG terminal facilities would have a permanent impact on visual resources. In particular, as figures 4.5.6-2 through 4.5.6-5 show, the tanks would be tall in relation to the surrounding structures. Although there are a substantial number of potential mobile and stationary viewers and visibility is high in some locations (e.g., Queensway Bridge), the LNG facilities would be seen in the context of the existing industrial facilities at the POLB and would not adversely affect the viewshed from sensitive locations or change the character of the landscape in terms of either physical characteristics or land uses. In addition, the LNG facilities would not block or alter an important/valued view or have an adverse effect on a scenic vista. The overall visual impact associated with the LNG terminal facility was rated moderate to low and the existing POLB facilities would screen, backdrop, and otherwise minimize the overall visual impact of the LNG storage tanks to less than significant levels.

TABLE 4.5.6-1

Visual Impact Summary for the LNG Terminal Facility Associated with the Long Beach LNG Import Project

Reference Point ^a	Viewing Point Location	Viewer Rating ^b	Visibility Rating ^c	Landscape Quality Rating ^d	Overall Rating
4a	Shoreline Park	M	L	M	M
4b	Shoreline Park Northwest of Queensway Bridge	L	M	M	M-L
6	Queen Mary	H	L	M	L
26	Queensway Bridge	M	M-H	L	M
27	Vincent Thomas Bridge/Ocean Boulevard	M	M-L	L	M-L
29	Ken Mallory Harbor Regional Park	M-L	L	M	L
30	Cabrillo Point	M-H	L	M	L
31	Belmont Shore	M-H	L	M-H	L
33	Fire Station/Mole Pier Entrance	M	H	M-L	M
35a	Ocean Boulevard West	M	M	L	M-L

^a Reference points are shown on figure 4.5.6-1.

^b A high viewer rating means that many viewers would see the LNG terminal facilities and that the views are visually sensitive. A low viewer rating means that few viewers would see the LNG terminal facilities and that the views are not visually sensitive.

^c A high visibility rating means more visibility factors are affected that result in the LNG terminal facilities being more visible. A low visibility rating means there are few visibility factors affected, resulting in the LNG terminal facilities being less visible.

^d A high landscape quality rating means that the landscape being viewed contains elements of landform, vegetation, water, and/or manmade features that are distinctive within the 5-mile radius. Low landscape quality ratings imply the view contains less distinctive elements.

H = High
M = Moderate
L = Low

The lighting associated with the LNG terminal facility would create a new source of light in the area. SES would install high-pressure sodium lighting at all outdoor locations, including the process unit, LNG storage tanks, truck loading facilities, ship unloading facilities, building exteriors, and roadways. To the extent practical, SES would use high-mast lighting with supplemental lighting to alleviate shadows. All lighting fixtures would be approved for the area classification in which they would be installed. Although the LNG terminal would create a new source of light in the area, it would be part of the overall industrial lighting in the Port area and would not be a substantial source of light or glare that would adversely affect day or nighttime views. Most of the facilities within the ports of Long Beach and Los Angeles are lit at night for safety and these lights form part of the visual character of the area. The proposed project would only incrementally add to this existing source of light in the area. Therefore, impacts associated with the lighting at the proposed LNG terminal facility would be less than significant.

The pipeline facilities would be constructed underground within heavily industrialized areas of the POLB and the POLA, and the Cities of Los Angeles, Long Beach, and Carson. Impacts on visual resources during construction of the pipelines would be limited to the heavy equipment used to install the pipe. This equipment would be similar to other heavy machinery used within the POLB and surrounding industrial areas and would not cause any additional impacts on visual resources. There would be no effect on visual resources during operation of the pipelines. Construction and operation of the aboveground facilities associated with the pipelines and the electric distribution facilities would have a permanent impact on visual resources; however, these facilities would be relatively minor and would be seen in the context of the existing industrial facilities at the POLB and the LARC. As a result, impacts on visual resources associated with these facilities would be less than significant.

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DRAFT ENVIRONMENTAL IMPACT STATEMENT/ENVIRONMENTAL IMPACT REPORT FOR THE LONG BEACH LNG IMPORT PROJECT

Docket No. CP04-58-000, et al.

Page 4-59
Figure 4.5.6-1

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4-70

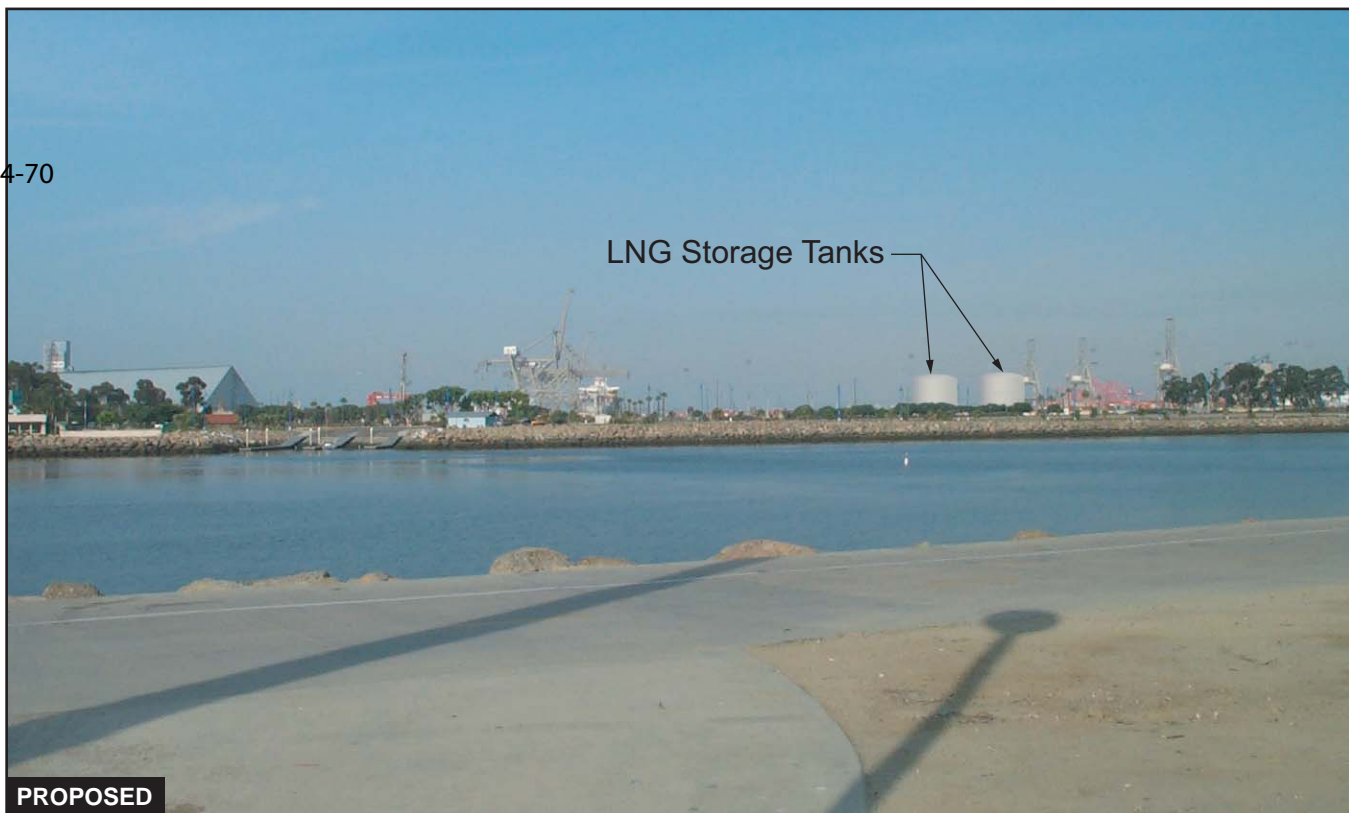


Figure 4.5.6-2
Long Beach LNG Import Project
Visual Simulation from Shoreline Park



Figure 4.5.6-3
Long Beach LNG Import Project
Visual Simulation from Queensway Bridge



Figure 4.5.6-4
Long Beach LNG Import Project
Visual Simulation from the Fire Station/Mole Entrance



Figure 4.5.6-5
Long Beach LNG Import Project
Visual Simulation from Cabrillo Point

4.6 SOCIOECONOMICS

4.6.1 Significance Criteria

A socioeconomic impact would be considered significant if project construction or operation would:

- cause a permanent population increase of 3 percent or more in a county affected by the project;
- cause the vacancy rate for temporary housing to fall to less than 5 percent;
- increase the short- or long-term demand for public services in excess of existing and projected capabilities;
- create demands that exhaust or exceed the capacity of existing utilities and service systems; or
- result in any racial, ethnic, or socioeconomic group bearing a disproportionate share of adverse impact.

4.6.2 Population

Table 4.6.2-1 provides a summary of selected population statistics for the State of California, Los Angeles County, and the Cities of Long Beach, Los Angeles, and Carson. Statistics are also provided for Orange County because of its close proximity to the project facilities. In 2000, the population of the City of Long Beach (461,522), the City of Los Angeles (3,694,820), and the City of Carson (89,730) accounted for 45 percent of the total population of Los Angeles County (9,519,338). The Cities of Long Beach, Los Angeles, and Carson experienced population increases of about 7.5, 6.0 percent, and 6.7 percent respectively, between 1990 and 2000. This population increase is similar to that of Los Angeles County as a whole (7.4 percent), but is significantly less than that of Orange County (18.1 percent). The City of Long Beach has the highest population density in the project area (8,391.0 people per square mile), which is significantly higher than the county average (2,344.2 people per square mile).

TABLE 4.6.2-1					
Existing Population Conditions in the Long Beach LNG Import Project Area					
State/County/City	Population			Population Density ^a	
	1990	2000	Percent Change	1990	2000
CALIFORNIA	29,760,021	33,871,648	13.6	190.8	217.2
Los Angeles County	8,863,164	9,519,338	7.4	2,182.5	2,344.2
City of Long Beach	429,433	461,522	7.5	7,807.8	8,391.0
City of Los Angeles	3,485,398	3,694,820	6.0	7,415.7	7,861.0
City of Carson	83,995	89,730	6.7	4,426.2	4,762.2
Orange County	2,410,556	2,846,289	18.1	3,055.2	3,605.6
^a Persons per square mile, based on population and area size: California (155,959 sq. mi.), Los Angeles County (4,061 sq. mi.), City of Long Beach (55 sq. mi.), City of Los Angeles (470 sq. mi.), City of Carson (19 sq. mi.), and Orange County (789 sq. mi.).					
Sources: U.S. Department of Commerce, Bureau of Census, 1990 Census of Population and Housing Characteristics, 2000 Census of Population and Housing Characteristics, 2000 Profile of General Demographic Characteristics, Income and Poverty Status in 1989 (1990 data set), (www.census.gov).					

SES estimates that the peak construction workforce would be about 404 workers during months 32 and 33 of the total 48-month construction period (see section 4.6.3). The majority of the construction workforce would be available within the Los Angeles and Orange County labor pool; however, some specialized LNG construction personnel may need to be obtained from outside the local labor pool. These workers could include supervisors and other specialized LNG personnel who would temporarily relocate to the project area.

Project-area population impacts are expected to be temporary and proportionally small. The total population change would equal the total number of non-local construction workers, plus any family members accompanying them. Assuming that 50 percent of the peak workforce relocates to Los Angeles County, the total increase in population would be about 586 or 202 workers accompanied by about 384 family members (based on the 2000 average of 2.9 persons per household in Los Angeles County). This temporary increase would not constitute a significant impact on population.

SES estimates employing a total of 60 full-time workers to operate the project facilities. Only six of these positions are expected to be obtained from outside the Los Angeles or Orange County areas. In addition, SES estimates that an additional 160 full-time workers would be employed by others to support the project operations; however, the workers for these indirect full-time jobs (e.g., truck drivers, tug boat crewmen, ship workers) are expected to be obtained entirely from the local area. The addition of six non-local, permanent employees to the project area would equal less than a 1 percent permanent increase in the population of either Los Angeles or Orange Counties. As a result, impacts on the local population associated with operation of the Long Beach LNG Import Project would be less than significant.

4.6.3 Economy and Employment

Education, health, and social services and the manufacturing industry are the largest economic sectors in the project area (see table 4.6.3-1). The top four employers in the City of Long Beach are the Long Beach Unified School District (11,096 employees); Boeing (10,500 employees); the City of Long Beach (5,942 employees); and California State University, Long Beach (5,609 employees) (City of Long Beach, 2003).

The 2000 civilian labor force in the City of Long Beach was 209,485, which is down 1 percent from 1990. This downward trend was also found in the Cities of Los Angeles and Carson and Los Angeles County. Only Orange County showed an increase in the workforce of 4 percent between 1990 and 2000. Unemployment rates increased by 0.7 percent in the City of Carson, 0.9 percent in the City of Los Angeles, and 2.5 percent in the City of Long Beach between 1990 and 2000. Unemployment rates also increased at the county level during that 10-year period (0.2 percent in Orange County and 0.8 percent in Los Angeles County). With the exception of Orange County, the unemployment rate in the project area was higher than the state average of 7 percent in 2000. Per capita income in 2000 ranged from \$17,107 in the City of Carson and \$20,671 in the City of Los Angeles to \$20,683 in Los Angeles County and \$25,826 in Orange County. In the project area, only Orange County's per capita income was higher than the state average in 2000 (\$22,711).

TABLE 4.6.3-1								
Existing Socioeconomic Conditions in the Long Beach LNG Import Project Area								
State/ County/City	Per Capita Income		Civilian Labor Force		Unemployment Rate (percent)		Top Two Major Industries	
	1990	2000	1990	2000	1990	2000	1990	2000
CALIFORNIA	\$16,409	\$22,711	14,922,811	15,829,202	6.6	7.0	Retail trade, Manufacturing - durable goods	Education, health and social services Manufacturing
Los Angeles County	\$16,149	\$20,683	4,538,364	4,312,264	7.4	8.2	Retail trade, Manufacturing - durable goods	Education, health and social services Manufacturing
City of Long Beach	\$15,639	\$19,040	211,638	209,485	6.9	9.4	Manufacturing - durable goods, Retail trade	Education, health and social services Manufacturing
City of Los Angeles	\$16,188	\$20,671	1,822,849	1,690,316	8.4	9.3	Retail trade, Manufacturing - durable goods	Education, health and social services Manufacturing
City of Carson	\$13,749	\$17,107	44,252	40,514	7.2	7.9	Manufacturing - durable goods, Retail trade	Education, health and social services Manufacturing
Orange County	\$19,890	\$25,826	1,357,847	1,411,901	4.8	5.0	Retail trade, Manufacturing - durable goods	Manufacturing, Education, health and social services
Sources: U.S. Department of Commerce, Bureau of Census, 2000 Profile of General Demographic Characteristics, Income and Poverty Status in 1989 (1990 data set), 2000 Profile of Selected Economic Characteristics, 1990 Labor Force Status and Employment Characteristics, (www.census.gov).								

SES anticipates that construction of the facilities would take about 48 months and would employ a peak workforce of 404 around months 32 and 33 of construction. Table 4.6.3-2 lists the worker classifications as a percent of the total workforce. As discussed in section 4.6.2, the majority of the construction workforce would be local hires, depending on union agreements and the methods the contractor uses to hire subcontractors. All of the trades are expected to be available from the local labor pool. The indirect workforce would include supervisors and other specialized LNG construction personnel who may need to be obtained from outside the local labor pool and would temporarily relocate to the project area. The support staff includes administrative and other support personnel that are expected to be available from the local labor pool. SES estimates the total construction payroll would be about \$100.6 million.

Of the 60 full-time workers SES would hire to operate the project facilities, about 54 workers are expected to be from the local area. In addition, SES estimates that an additional 160 full-time workers would be employed by others to support the project operations for a total of 220 full-time jobs. The workers for these indirect full-time jobs are expected to be obtained entirely from the local labor pool. As a result, construction and operation of the Long Beach LNG Import Project would have a beneficial impact on the local economy and employment. An estimate of the amount of tax revenues generated during construction and operation of the project is presented in section 4.6.8.

Scoping comments were received about possible effects on jobs and commerce, including commercial fishing, caused by shipping delays when an LNG ship is present within the POLB. Delays to other vessels associated with the arrival or departure of an LNG ship are expected to be minor and would not have an impact on jobs or commerce within the POLB. A detailed discussion of marine transportation and the effects of LNG ship arrivals and departures on ship traffic within the Port is presented in section 4.7.3.

TABLE 4.6.3-2	
Construction Workforce Classifications for the Long Beach LNG Import Project	
Worker Classification	Percent of Total Workforce
Trades	
Concrete	20
Iron Worker	18
Laborers	13
Painters/Insulators	12
Piping	4
Equipment Operator	3
Truck Driver	3
Electrical	2
Rigger	2
Carpenters, rebar, concrete finishers	<1
Mechanical	<1
Trades Subtotal	77
Indirect	9
Support Staff	14
Total	100

Comments were also received about the potential economic impact of a closure of the POLB due to disruption of the LNG terminal by either natural disaster or terrorism. A discussion of hazards that would result from an accidental or intentional (e.g., terrorist-induced) release of LNG or other hydrocarbons in or near SES' proposed LNG import terminal is presented in section 4.11 and Appendix F. The economic effects of a closure of the POLB due to a disruption of the LNG terminal cannot realistically be analyzed quantitatively. In general, however, the extent of impacts associated with a closure of the POLB would be a function of the duration of the closure and the capacity of other ports along the west coast to compensate for the closure. In September 2001, ports along the west coast closed due to a labor lockout. This event provides insight into the possible economic effects associated with a closure of the POLB. Initial estimates during the west coast labor lockout were that the nation was losing \$1 billion a day; however, most industry observers thought that the relatively short duration of the lockout (10 days) resulted in a much lower impact (i.e., around several hundred million dollars a day at most).

Most of the economic impacts associated with the west coast lockout were in the form of increased inventory carrying costs by shippers who were delayed in receiving their cargo, product spoilage, and lost salaries for the International Longshore and Warehouse Union (ILWU) (although overtime paid later probably offset this loss). It should be emphasized, however, that the lockout extended to the entire west coast and opportunities for diversion of discretionary cargo were relatively constrained (all-water through the Panama or Suez Canals). For a scenario in which a closure would only affect the POLB, there would be many more opportunities to divert non-local cargo. For example, the ports of Seattle/Tacoma and Oakland could handle much of the diverted cargo during the short term. In addition, if the POLA were still operating, it could increase local cargo handling during a closure of the POLB. The likely scenario associated with a closure of the POLB would be that many transpacific services would adjust their rotation and call at Seattle/Tacoma or Oakland first to discharge the intermodal cargo and then call at the POLA to deliver primarily local cargo. Although there would be some delays, the west coast port system could handle a short-term closure of the POLB. According to the POLB, the Port would have to be closed for an extended period of time before significant economic impacts would occur.

4.6.4 Housing

Housing statistics are presented in table 4.6.4-1. The City of Long Beach has the highest owner and rental vacancy rates in the project area (2.2 percent and 4.2 percent, respectively) and when compared to the state averages (1.4 percent and 3.7 percent, respectively). The rental vacancy rate in the City of Los Angeles is lower than the state average but the owner vacancy rate is higher than the state average. In the City of Carson, both the owner and rental vacancies rates are lower than the state average. Median gross monthly rent is lowest in the City of Long Beach.

TABLE 4.6.4-1												
1990 and 2000 Housing Characteristics in the Long Beach LNG Import Project Area												
State/County/City	Owner Occupied (percent)		Renter Occupied (percent)		Owner Vacancy (percent)		Rental Vacancy (percent)		Median Value, Owner Occupied Units		Median Gross Monthly Rent	
	1990	2000	1990	2000	1990	2000	1990	2000	1990	2000	1990	2000
CALIFORNIA	55.6	56.9	44.4	43.1	2.0	1.4	5.9	3.7	\$195,500	\$211,500	\$561	\$747
Los Angeles County	48.2	47.9	51.8	52.1	1.9	1.6	5.9	3.3	\$226,400	\$209,300	\$570	\$704
City of Long Beach	41.0	41.0	59.0	59.0	1.7	2.2	7.4	4.2	\$222,900	\$210,000	\$551	\$639
City of Los Angeles	39.4	38.6	60.6	61.4	1.8	1.8	6.6	3.5	\$244,500	\$221,600	\$544	\$672
City of Carson	79.0	77.9	21.0	22.1	1.1	1.1	4.5	2.6	\$188,100	\$183,200	\$648	\$754
Orange County	60.1	61.4	39.9	38.6	1.8	0.9	6.6	3.0	\$252,700	\$270,000	\$728	\$923
Source: U.S. Department of Commerce, Bureau of the Census, 1990 Census of Population and Housing, 2000 General Population and Housing Characteristics (www.census.gov).												

Temporary housing availability varies seasonally within the project area. Temporary housing is available in the form of daily, weekly, and monthly rentals in motels, hotels, campgrounds, and rooming houses. Because of the urban and highly developed nature of the project area, there are numerous temporary housing facilities within commuting distance to the POLB. For example, in 2000, Los Angeles County had 137,135 vacant housing units, including 56,089 units available for rent and 13,565 units available for seasonal, recreational, or occasional use (U.S. Department of Commerce, 2000a). The City of Long Beach alone has over 5,000 hotel and motel rooms.

Assuming that 50 percent of the peak workforce relocates to the project area and local construction workers do not require housing, up to 202 housing units may be required. Given the vacancy rates, the number of rental housing units in the area, and the number of hotel/motel rooms and other temporary housing available in the project area, the construction workforce should not encounter difficulty in finding temporary housing. Only six housing units would be required to accommodate the permanent employees that would be obtained from outside the Los Angeles or Orange County areas. Construction and operation of the Long Beach LNG Import Project would not cause the vacancy rates for temporary housing to fall to less than 5 percent because the vacancy rates in the project area are currently already below 5 percent. Construction and operation of the project would not significantly change the vacancy rates in the project area. As a result, the Long Beach LNG Import Project would not have a significant impact on housing in the project area.

4.6.5 Public Services

A wide range of public services and facilities are offered in the Cities of Long Beach and Los Angeles. Services and facilities include full-service law enforcement, paid fire departments, emergency response services, and hospitals. The City of Carson does not have its own fire or police departments; these services are provided by Los Angeles County.

Three public safety agencies provide emergency response service to the City of Long Beach and the POLB. They include the Long Beach City Fire Department (LBFD), the Long Beach Police Department (LBPD), and the Coast Guard District 11. The city also has informal mutual aid agreements with the County of Los Angeles and the City of Los Angeles, and can receive assistance under California's Master Mutual Aid Plan if an emergency incident is beyond the capability of the local resources.

The LBPD has one main police station and three division substations. It employs over 900 sworn officers. The LBFD consists of about 500 personnel, of which 402 are assigned various emergency response duties. The remaining personnel are assigned to support functions. The LBFD would be responsible for an initial public safety response to a product release, fire, or medical emergency at the LNG terminal facility.

The LBFD has a total of 23 fire stations that house 22 engine companies, 4 truck companies, 18 paramedic capable resources (8 of which are transport capable ambulances), 3 airport crash/rescue vehicles, 1 foam apparatus, 6 fire and lifeguard boats, and 4 beach rescue units. In 2002, the LBFD handled a total of 54,436 responses, most of which were medical (35,956) and fire (5,653) related. When last rated by the Insurance Service Organization (ISO), the LBFD earned a Class 1 rating that signifies exemplary fire protection (ISO, 2003).

The City of Long Beach is divided into three geographic areas or districts for the administration of emergency responses. District 1 serves the downtown area and the POLB. District 1 resources include eight fire stations strategically located throughout the POLB and the downtown area with eight fire engines, four paramedic rescue ambulances, two truck companies, two fireboats, and one technical rescue vehicle. Fifty-two personnel staff the District 1 facilities on a daily basis. Fire Station 24, currently located at the LNG terminal site, would be relocated to a new site less than 1 mile away. Three other District 1 fire stations are within 4 miles of the LNG terminal site and another three stations are within 5 miles. Additional nearby resources include the City of Los Angeles Fire Department (LAFD) Task Force 38, which is within 4 miles of the LNG terminal site and LAFD Task Force 48 and Hazardous Materials Company 48, which are located within 6 miles of the site.

There are three major hospitals in the City of Long Beach: Long Beach Memorial Hospital, Pacific Hospital of Long Beach, and the St. Mary Medical Center. Long Beach Memorial Hospital is the second largest private hospital on the west coast with 726 beds, 1,200 physicians, and 3,500 employees. The Pacific Hospital of Long Beach is a full service, teaching hospital with 208 beds and over 700 employees. The St. Mary Medical Center has 539 beds, 1,249 employees, and 157 medical staff.

Because the non-local workforce would be small relative to the current population, construction of the project facilities would not impact the local community facilities and services such as police, fire, and medical services. The City of Long Beach has adequate infrastructure and community services to meet the needs of the non-local workers that would be required for the project. Other construction-related demands on local agencies could include increased enforcement activities associated with issuing permits for vehicle load and width limits, local police assistance during construction at road crossings to facilitate traffic flow, and emergency medical services to treat injuries resulting from construction accidents.

LNG would be a new product to the POLB; therefore, it also would be new to the local fire and emergency response services. Although the LBFD has experience responding to and effectively handling emergency incidents involving bulk petroleum facilities and transport ship-related incidents at the POLB, specialized training may be necessary for local fire services to properly understand the risks associated with LNG. The National Association of State Fire Marshals (NASFM), the OPS, and the OEP are developing an LNG safety training module that will be added to the existing firefighter safety program material. The intention is to educate and train the local fire services in the risks associated with LNG so that they will be positioned to take a leadership role in further educating emergency first responders in the communities they serve.

SES is working with local emergency providers to develop procedures to handle potential fire emergencies at the LNG terminal site and on LNG ships. The procedures would be included in an Emergency Response Plan for the facility. Additional information on emergency response procedures is provided in section 4.11.9. SES assisted the Fire Prevention Bureau of the LBFD with the selection of a third-party consultant to help the department conduct technical reviews of the facility's procedures and has also offered to provide funding for a plan check/inspection position within the Fire Prevention Bureau. In addition, SES is working with the LBFD to provide hazard control and firefighting training that is specific to LNG and LNG vessels. SES would fund a live-fire training session and demonstration for LBFD personnel at the proposed terminal site. SES has also offered to sponsor and conduct a familiarization tour of an LNG facility similar to the proposed project. In addition, SES has committed to funding all necessary security/emergency management equipment and personnel costs that would be imposed on state and local agencies as a result of the project and would prepare a comprehensive plan that identifies the mechanisms for funding these costs. To allow the FERC and the POLB the opportunity to review the plan, the Agency Staffs will recommend to their respective Commissions that SES file its comprehensive plan identifying the mechanisms for funding all project-specific security/emergency management costs that would be imposed on state and local agencies concurrent with its submission of the Follow-on WSA to the FERC staff (see section 4.11.7.4). The LBFD's experience, extensive and comprehensive training in petroleum and shipboard firefighting, in addition to the training specific to LNG that would be provided by SES and SES' commitment to fund emergency management equipment and personnel costs should adequately equip the LBFD to handle any type of emergency at the proposed LNG terminal facility.

Overall, construction and operation of the proposed project would not result in an increase in the short- or long-term demand for public services in excess of existing and projected capabilities.

4.6.6 Utilities and Service Systems

The cities in the project area have extensive and well established utilities and service systems. Construction and operation of the Long Beach LNG Import Project could affect the existing electric, water, storm water, and solid waste disposal systems in the project area. The project could also affect existing pipelines located within the construction work area.

The project power supply would be purchased from SCE, which is the public electric power supplier. In order to serve the LNG terminal, SCE would install 0.8 mile of electric distribution lines to provide 66 kV service to a new substation located within the terminal boundaries (see sections 2.1.4 and 4.5.2.3). Emergency power would be provided by a backup internal combustion engine generator. An uninterruptible power supply system would be provided and the plant electrical system would be furnished with automatic start and transfer devices to ensure that a loss of power would immediately start the emergency power generator.

Construction and operation of the project would require water for several activities, including hydrostatic testing, operation of the vaporization equipment, filling of the firewater storage tank, and monthly testing of the fire pumps (see section 4.3.2.2). Water would be supplied to the LNG terminal by the POLB from the City of Long Beach Water Department. In turn, the City of Long Beach is supplied by the Metropolitan Water District (about 56 percent) and by local groundwater supplies from the West Coast Basin (about 44 percent), which is part of the Coastal Plain Aquifer System. According to the City of Long Beach, the water requirements for the project would not exceed existing water supplies and would not require the construction of new or expanded water facilities (see section 4.3.2.2).

The storm water drainage system would be installed so that surface water and spills from flammable liquids would drain to designated areas for safe containment and disposal. A system of trenches directed to a spill containment sump would be installed within the process area, while a system of swales, ditches, and culverts would be installed throughout the rest of the facility that connects to the existing POLB storm water drainage system. The project is not expected to exceed existing wastewater capacity or require the construction of new or expanded wastewater treatment or storm water drainage facilities beyond those at the LNG terminal site.

The materials dredged from the West Basin during preparation of the ship berth and reinforcement of the shoreline structures would be disposed of at an approved site, most likely within the POLB. Spoil generated during construction of the LNG terminal, pipelines, and electric distribution facilities would also be hauled and disposed of at approved sites. The solid waste disposal needs during operation of the project would be modest and would be accommodated by existing recycling programs and landfills. The project would comply with federal, state, and local statutes and regulations related to wastewater and solid waste disposal and would not have significant impacts on these resources.

SES and the pipeline contractor(s) would participate in the “One-Call” system to ensure that existing pipelines are located before construction and, if necessary, relocated out of the construction work area. The pipeline contractor(s) would also work with the DOGGR, SCE, and other POLB tenants to protect existing utilities and other facilities.

Overall, construction and operation of the proposed project would not create demands that exhaust or exceed the capacity of existing utilities and service systems.

4.6.7 Property Values

The LNG terminal facilities associated with the Long Beach LNG Import Project would be located within an industrial area under the jurisdiction of the POLB. The natural gas and C₂ pipelines would also be located in areas designated for industrial use. The nearest potential residences are in a recreational vehicle park about 1.5 miles east-northeast of the LNG terminal site and possibly live-aboard boats at two marinas in the East Basin of the Cerritos Channel between 1.2 and 1.6 miles northwest of the LNG terminal. As a result, the project would not have an adverse impact on property values. As discussed in section 4.5.2.2, the pipelines would cross two privately owned parcels within the POLB and others outside of the POLB. No impacts on the property values for these parcels are anticipated because they already contain industrial facilities or are located in areas designated for industrial use.

4.6.8 Tax Revenues

Construction and operation of the Long Beach LNG Import Project would have a beneficial impact on local tax revenue. Revenue from sales tax would be greater during construction based on the temporary influx of workers to the area. The project would generate a construction payroll of about \$100.6 million over the 48-month construction period.

During operation of the project, the payroll would be about \$3.7 million annually for the 60 full-time employees. The project would generate an estimated \$9.2 million in state, county, and local taxes per year. The \$9.2 million is based on an estimated \$6.6 million in income taxes (includes the 60 full-time employees as well as workers employed by others to support the project operations and income taxes on the product throughput), \$2.2 million in property taxes, and \$400,000 in sales taxes. Of the \$9.2 million in tax revenues, about \$3.8 million would be paid to the City of Long Beach, \$2.1 million would be paid to local schools, \$1.5 million would be paid to the County of Los Angeles, \$920,000 would be paid to the State of California, and \$900,000 would be paid to a special district. This increase in tax revenue would be permanent.

4.6.9 Environmental Justice

Executive Order 12898 on Environmental Justice recognizes the importance of using the NEPA process to identify and address, as appropriate, disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minority populations and low-income populations. The provisions of Executive Order 12898 apply equally to Native American programs. The EPA provides guidance on determining whether there is a minority or low income community to be addressed in a NEPA analysis. Minority population issues must be addressed when they comprise over 50 percent of an affected area or when the minority population percentage of the affected area is substantially greater than the minority percentage in the larger area of the general population. Low income populations are those that fall within the annual statistical poverty thresholds from the U.S. Department of Commerce, Bureau of the Census Population Reports, Series P-60 on Income and Poverty.

A scoping comment suggested that the project's exclusion zone boundaries should be used to identify environmental justice boundaries. The exclusion zone boundaries extend outside of the LNG terminal site but are within the area immediately surrounding the site within the boundaries of the POLB (i.e., the exclusion zone boundaries do not extend outside of the Port) (see section 4.11.5). This environmental justice analysis includes not only the census tracts within the exclusion zone boundaries but also the census tracts within approximately 2 miles of the LNG terminal site (see figure 4.6.9-1 and table 4.6.9-1). The data from the study area census tracts were compared to data for the Cities of Long Beach, Los Angeles, and Carson and Los Angeles and Orange Counties (see table 4.6.9-2).

The LNG terminal site and electric distribution facilities would be located in census tract 5756. The natural gas and C₂ pipelines would be located in census tracts 5756 and 2947 and the C₂ pipeline would also be located in census tracts 2941.20 and 5439.04. There are no residential neighborhoods within census tracts 5756, 2947, or 5439.04. Residential neighborhoods do appear to exist within census tract 2941.20; however, the proposed C₂ pipeline would not cross these neighborhoods. Established residential neighborhoods border the POLB to the north and east (census tracts 5753, 5754.01, 5754.02, 5755, 5758.01, 5758.02, 5758.03, 5759.01, 5759.02, 5760, 5761, 5762, 5763, 5766.01) and the POLA to the northwest (census tract 2961).

As shown in table 4.6.9-1, Caucasians were the largest population group in 18 of the 19 census tracts, ranging from 22 percent (census tract 5753) to 70 percent (census tract 5761). Census tract 5756 has a larger percentage of African Americans (24 percent) than Caucasians (17 percent). Caucasians were also the largest population group in the surrounding cities (ranging from 26 percent in Carson to 47 percent in Los Angeles) and counties (49 percent in Los Angeles County and 65 percent in Orange County). Generally, the identified study area census tracts had a higher percentage population of African Americans, other races, and Hispanics and a lower percentage of Asians than the Cities of Long Beach and Los Angeles and Los Angeles and Orange Counties. In total, the non-Caucasian population in the study area census tracts constitutes about 64 percent of the total population. Therefore, the study area is considered a minority community based on its aggregate minority population.

Non-Internet Public

DRAFT ENVIRONMENTAL IMPACT STATEMENT/ENVIRONMENTAL IMPACT REPORT FOR THE LONG BEACH LNG IMPORT PROJECT

Docket No. CP04-58-000, et al.

Page 4-73
Figure 4.6.9-1

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TABLE 4.6.9-1									
Population Statistics for the Census Tracts Surrounding the Long Beach LNG Import Project									
Census Tract	Total Population	Racial/Ethnic Group, 2000 Census (percent)						Median Household Income (1999)	Families Below Poverty (percent)
		Caucasian	African American	Native American and Alaskan Native Persons	Asian	Persons Reporting Some Other Race	Persons of Hispanic or Latino Origin ^a		
2941.20 ^b	2,529	31	10	1	2	56	86	\$42,109	28
2947 ^c	3,270	34	6	1	2	58	84	\$21,914	40
2961	1,434	47	24	2	3	24	38	\$31,500	0
5439.04 ^b	4,426	28	12	1	10	48	70	\$43,102	22
5753	4,981	22	20	1	17	39	54	\$20,571	35
5754.01	5,476	28	9	1	5	56	79	\$19,789	47
5754.02	3,758	25	11	1	5	57	76	\$19,841	51
5755	252	36	8	1	3	52	63	\$13,750	77
5756 ^d	46	17	24	2	2	47	40	\$152,338 ^e	NA
5758.01	2,721	31	4	1	1	62	87	\$23,750	46
5758.02	5,433	33	10	1	5	52	76	\$19,349	50
5758.03	2,968	39	17	1	11	32	49	\$17,109	43
5759.01	3,825	30	22	1	7	39	53	\$25,898	34
5759.02	5,108	42	19	1	7	31	39	\$23,170	33
5760	445	49	19	0	8	23	29	\$28,750	0
5761	2,669	70	10	1	7	12	17	\$29,004	14
5762	5,652	40	19	2	3	37	52	\$16,739	31
5763	8,912	28	19	2	12	38	55	\$21,336	37
5766.01	4,395	61	14	1	6	19	22	\$31,426	15
^a Hispanics may be of any race and are also included in other applicable race categories. ^b Crossed by the C ₂ pipeline. ^c Crossed by the natural gas and C ₂ pipelines. ^d The proposed LNG terminal and electric distribution facilities would be located within this census tract and the natural gas and C ₂ pipelines would also cross this census tract. ^e Median income is not representative of the area because it includes activities associated with the POLB.									
Source: U.S. Department of Commerce, Bureau of the Census, 2000 Census of Population and Housing (www.census.gov).									
NA = Not applicable.									

TABLE 4.6.9-2								
Population Statistics for the Cities and Counties Surrounding the Long Beach LNG Import Project								
State/County/City	Racial/Ethnic Group, 2000 Census (percent)						Median Household Income (1999)	Families Below Poverty (percent)
	Caucasian	African American	Native American and Alaskan Native Persons	Asian	Persons Reporting Some Other Race	Persons of Hispanic or Latino Origin ^a		
CALIFORNIA	60	7	1	11	17	32	\$47,493	14
Los Angeles County	49	10	1	12	40	28	\$42,189	14
City of Long Beach	45	15	1	12	31	22	\$37,270	19
City of Los Angeles	47	11	1	10	41	30	\$36,687	18
City of Carson	26	25	1	22	18	35	\$54,886	9
Orange County	65	2	1	13	26	19	\$58,820	7
^a Hispanics may be of any race and are also included in other applicable race categories.								
Source: U.S. Department of Commerce, Bureau of the Census, 2000 Census of Population and Housing (www.census.gov).								

Median household income ranged from \$13,750 (census tract 5755) to \$43,102 (census tract 5439.04) in the study area census tracts. By comparison, other median household income in the project area ranged from \$36,687 (City of Los Angeles) to \$58,820 (Orange County). The same trend was apparent in the number of families below poverty where the study area census tracts ranged from 0 percent (census tracts 2961 and 5760) to 77 percent (census tract 5755) and the general project area ranged from 7 percent (Orange County) to 19 percent (City of Long Beach).

The proposed project would result in impacts on air quality from several criteria air pollutants during operation, even after the implementation of control and mitigation measures. These impacts would affect the environmental justice study area census tracts; however, all populations within these areas would be affected equally. A Health Risk Assessment was conducted to evaluate the potential for impacts on human health associated with air toxics (see section 4.9.7). The assessment concluded that the impact of the Long Beach LNG Import Project on human health risks would be less than significant; however, toxic air pollutants resulting from the project would likely contribute to an existing cumulatively significant air quality impact in the south-central Los Angeles area, the harbor area, and near freeways (see section 4.12).

Potentially significant impacts associated with geologic hazards would occur at the LNG terminal site but would not affect the existing seismic risks to offsite facilities or structures. Seismic activity could potentially damage the LNG terminal site facilities, shoreline structures, and pipeline and electric distribution facilities; however, the project facilities would be designed to meet or exceed the seismic design criteria of NFPA 59A, the more stringent criteria of the POLB, and other applicable codes (e.g., the California Building Code). Implementation of approved final designs for the LNG tanks, shoreline structures, and other critical structures at the LNG terminal would reduce the potential effects of seismic hazards to less than significant levels (see section 4.1.4).

Significant impacts on biological resources would be reduced to less than significant levels through the implementation of control measures (see section 4.4). In addition, none of these impacts would occur on resources beyond the Port's boundaries. Although traffic generated during project construction would result in temporary adverse impacts on project area roadways, it is not expected that such impacts would affect the environmental justice study area census tracts (see section 4.7.2). The project is not expected to result in a substantial increase in the potential for incidents that would cause serious injury or death to members of the public. Furthermore, project construction would provide some short-term job opportunities. The only long-term socioeconomic effect of the project is likely to be beneficial, based on the increase in local tax revenues.

Executive Order 12898 also emphasizes the importance of providing opportunities for community input in the NEPA process. As part of the Pre-Filing Process, the FERC and the POLB worked with SES to develop a public outreach plan for issue identification and stakeholder participation. As part of the outreach plan, the mailing list for the project was initiated. The mailing list was updated and expanded when the FERC's and the POLB's NOI/NOP was issued and when the POLB's first Supplemental NOP was issued. The mailing list was also expanded when SES modified its proposal to manage NGL and when the POLB's second Supplemental NOP was issued, and has been continually updated during the EIS/EIR process. All affected landowners, as identified by SES, received the notices about the project without any distinction based on minority or income status. Native American groups identified as having an interest in the project area also received the notices about the project. The distribution list for this draft EIS/EIR included federal, state, and local agencies; elected officials; environmental and public interest groups; Native American tribes; affected landowners; Port tenants; intervenors to the FERC's proceeding; local libraries and newspapers; and other interested parties (i.e., miscellaneous individuals who provided scoping comments or asked to be on the mailing list). A formal notice indicating that the draft EIS/EIR is available for review and comment was published in the Federal Register, posted in the Los Angeles

County Clerk's office in California, and sent to the remaining individuals on the mailing list. The distribution list for the draft EIS/EIR and formal notice is in Appendix A.

SES sponsored two public workshops in the Long Beach area to inform agencies and the general public about LNG and the proposed project and provide them an opportunity to ask questions and express their concerns. The FERC and the POLB held a public scoping meeting to provide affected landowners; Port tenants; federal, state, and local government agencies; elected officials; environmental and public interest groups; Native American tribes; and other interested individuals an opportunity to comment on the project. The date and location of the scoping meeting was published in local area newspapers. Section 1.3 further describes the public notification and participation process. Section 4.8.4 describes contacts with Native American tribes that traditionally occupied the project area.

In summary, the Long Beach LNG Import Project would not result in disproportionately high and adverse human health or environmental effects on minority and/or low income communities or Native American tribes.

4.7 TRANSPORTATION

4.7.1 Significance Criteria

Impacts on vehicular traffic at an intersection would be considered significant if:

- the following impact thresholds for the City of Long Beach would be exceeded:
 - a. the volume-to-capacity (V/C) ratio would change on a facility operating at a level of service (LOS) A, B, C, or D to LOS E or F; or
 - b. the V/C ratio would increase by 0.02 or more on a facility operating at LOS E or F.
- the following impact thresholds for the POLA/City of Los Angeles would be exceeded:
 - a. the V/C ratio would increase by 0.04 or more on a facility operating at LOS C ($>0.70 - 0.80$);
 - b. the V/C ratio would increase by 0.02 or more on a facility operating at LOS D ($>0.80 - 0.90$); or
 - c. the V/C ratio would increase by 0.01 or more on a facility operating at LOS E or F (>0.90).

The Los Angeles County CMP indicates that impacts on freeway traffic would be considered significant if:

- the demand-to-capacity (D/C) ratio would increase by 0.02 or more on a facility operating at LOS F.

Impacts on marine vessel transportation would be considered significant if project construction or operation would:

- cause an increase in traffic that would result in congestion within the harbor and/or if the capacity for maritime commerce to operate efficiently and safely would be exceeded.

Impacts on air transportation would be considered significant if project construction or operation would:

- result in a permanent change in air traffic patterns.

4.7.2 Ground Transportation

4.7.2.1 Environmental Setting

Roadways/Intersections

Regional access to the proposed LNG terminal site on Pier T is provided by a network of freeway and arterial facilities (see figure 4.7.2-1). The freeways include the Harbor Freeway (Interstate 110), the Long Beach Freeway (Interstate 710), and the Terminal Island Freeway (State Route 47 and State Route 103), while the arterial street network includes Ocean Boulevard/Seaside Avenue, Pier S Avenue, Henry Ford Avenue, Alameda Street, Anaheim Street, and the Pacific Coast Highway (State Route 1).

Non-Internet Public

DRAFT ENVIRONMENTAL IMPACT STATEMENT/ENVIRONMENTAL IMPACT REPORT FOR THE LONG BEACH LNG IMPORT PROJECT

Docket No. CP04-58-000, et al.

Page 4-78
Figure 4.7.2-1

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The Harbor and Long Beach Freeways are north-south highways that extend from the Port area to downtown Los Angeles. Both freeways have six lanes in the vicinity of the harbor and widen to eight lanes to the north. The Terminal Island Freeway extends from Terminal Island across the Heim Bridge and terminates at Willow Street. It is six lanes wide between Ocean Boulevard and Anaheim Street, where it narrows to four lanes.

The key access streets in the area are Harbor Scenic Drive, Ocean Boulevard/Seaside Avenue, Pier S Avenue, and Pier T Avenue. Curbside parking is prohibited on all of these streets. Ocean Boulevard/Seaside Avenue, a six-lane street, is the primary east-west arterial to the north of the project site. Seaside Avenue is within the City of Los Angeles and Ocean Boulevard is within the City of Long Beach. The remaining streets have two lanes in each direction at most locations.

Peak hour traffic volume data for the roadways in the project area were collected to quantify the existing traffic conditions. Peak hour traffic counts at the project area intersections were conducted in 2004. Appendix D contains the peak hour volumes.

Thirteen key intersections were selected for detailed analysis based on a review of previous Port-related environmental documentation and estimated travel patterns for the proposed project. These locations, identified on figure 4.7.2-1 and listed in table 4.7.2-1, were analyzed to determine their LOS during the morning and evening peak hours on a typical weekday. Peak hours at the intersection were analyzed from 8 to 9 a.m. and from 4 to 5 p.m.

TABLE 4.7.2-1	
Study Intersections	
Intersection	Type
1. Terminal Island Freeway Northbound On-Ramp and New Dock Street/Pier S Access Road	All-way stop-controlled intersection
2. Terminal Island Freeway Southbound Off-Ramp and New Dock Street	Stop controlled on minor street only
3. Terminal Island Freeway and Ocean Boulevard (existing and future configuration analyzed for respective scenarios)	Signalized intersection
4. Pier S Avenue and Ocean Boulevard (existing and future configuration analyzed for respective scenarios)	Signalized intersection
5. Pier S Avenue and New Dock Street	Signalized intersection
6. Pier S Avenue and SERRF Driveway	Stop controlled on minor street only
7. Navy Way and Seaside Avenue (existing and future configuration analyzed for respective scenarios)	Signalized intersection
8. Henry Ford Avenue and Terminal Island Freeway On/Off Ramps	Signalized intersection
9. Henry Ford Avenue and Anaheim Street	Signalized intersection
10. Henry Ford Avenue and Deni Street	Signalized intersection
11. Anaheim Street and Alameda Street	Signalized intersection
12. Pacific Coast Highway and Alameda Street east on Alameda Street	Signalized intersection ^a
13. Pacific Coast Highway and Alameda Street north on Pacific Coast Highway	Signalized intersection ^a
^a Analyses assume two intersections due to grade separation of Pacific Coast Highway and Alameda Street per current design plans.	

LOS is a qualitative indication of an intersection's operating conditions as represented by traffic congestion and delay and V/C ratio. For signalized intersections, it is measured from LOS A (little or no delay/congestion) to LOS F (intersection failure/gridlock), with LOS D (V/C of 0.90) typically considered to be the threshold of acceptability. The relationship between V/C ratio and LOS for signalized intersections is provided in table 4.7.2-2.

TABLE 4.7.2-2		
Relationship Between the Volume-to-Capacity Ratio and Level of Service for Signalized Intersections		
Volume-to-Capacity Ratio	Level of Service	Traffic Conditions
0 to 0.60	A	Little or no delay/congestion
> 0.60 to 0.70	B	Slight congestion/delay
> 0.70 to 0.80	C	Moderate delay/congestion
> 0.80 to 0.90	D	Significant delay/congestion
> 0.90 to 1.00	E	Extreme congestion/delay
1.00 +	F	Intersection failure/gridlock

For signalized intersections the LOS values were determined by using the Intersection Capacity Utilization methodology in Long Beach and the Critical Movement Analysis methodology in Los Angeles. A capacity value of 1,600 vehicles per hour per lane was used (2,880 for dual left turn lanes). Trucks use more roadway capacity than automobiles because of their size and acceleration capabilities; therefore, a passenger car equivalent factor of 1.1 was applied to tractors, 2.0 was applied to chassis, and 2.0 was applied to the container truck volumes for the LOS calculations.

Stop-controlled intersections were analyzed using methodologies contained in the Highway Capacity Manual in which LOS is based on average vehicular delay (Transportation Research Board, 2000). Highway links were assessed, assuming a per lane capacity of 2,000 vehicles per hour. The relationship between delay and LOS for stop-controlled intersections (two-way and multi-way stops) is provided in table 4.7.2-3.

TABLE 4.7.2-3	
Relationship Between Delay and Level of Service for Stop-Controlled Intersections (Two-Way and Multi-Way Stops)	
Intersection Level of Service	Average Delay (seconds/vehicle)
A	≤10
B	>10 and ≤15
C	>15 and ≤25
D	>25 and ≤35
E	>35 and ≤50
F	>50

Freeway segments were analyzed in compliance with the Los Angeles County CMP. The CMP uses a D/C ratio to determine LOS. The relationship between the D/C ratio and the LOS for freeway segments as identified in the CMP is provided in table 4.7.2-4.

TABLE 4.7.2-4	
Relationship Between the Demand-to-Capacity Ratio and the Level of Service for Freeway Segments	
Freeway Level of Service	Demand-to-Capacity Ratio
A	0.01-0.35
B	0.36-0.54
C	0.55-0.77
D	0.78-0.93
E	0.94-1.00
F	>1.00

Based on peak hour traffic volumes, the average intersection delays and corresponding LOS have been determined and are summarized in table 4.7.2-5. As shown in table 4.7.2-5, two of the existing

study intersections currently operate at LOS E or F while the remaining study intersections operate at LOS D or better during the peak hours. The locations at LOS E or F are:

- Terminal Island Freeway and Ocean Boulevard
- Pier S Avenue and Ocean Boulevard

TABLE 4.7.2-5				
Existing Intersection Level of Service Analysis				
Intersection	2003 Existing Conditions			
	Morning Peak Hour		Evening Peak Hour	
	LOS	V/C or Delay	LOS	V/C or Delay
1. Terminal Island Freeway Northbound On-Ramp and New Dock Street/Pier S Access Road ^a	A	8	B	12
2. Terminal Island Freeway Southbound Off-ramp and New Dock Street ^b	B	12	B	11
3. Terminal Island Freeway and Ocean Boulevard (existing configuration) ^c	F	1.114	F	1.284
4. Pier S Avenue and Ocean Boulevard (existing configuration) ^c	D	0.847	E	0.914
5. Pier S Avenue and New Dock Street ^c	A	0.261	A	0.219
6. Pier S Avenue and SERRF Driveway ^b	B	11	B	10
7. Navy Way and Seaside Avenue ^c	B	0.659	B	0.601
8. Henry Ford Avenue and Terminal Island Freeway On/Off Ramps ^c	A	0.234	A	0.366
9. Henry Ford Avenue and Anaheim Street ^c	A	0.592	C	0.767
10. Henry Ford Avenue and Deni Street ^c	A	0.261	A	0.487
11. Anaheim Street and Alameda Street ^c	A	0.558	C	0.785
12. Pacific Coast Highway and Alameda Street east on Alameda Street ^{c, d}	B	0.614	C	0.704
13. Pacific Coast Highway and Alameda Street north on Pacific Coast Highway ^{c, d}	A	0.421	A	0.555
^a All-way stop-controlled intersection; weighted average delay for entire intersection reported. ^b Stop controlled on minor street only; delay for most constrained approach is reported. ^c Signalized intersection. ^d Analyses assume two intersections due to grade separation of Pacific Coast Highway and Alameda Street per current design plans. LOS = Level of Service. V/C = Volume-to-Capacity Ratio. Delay = Seconds per vehicle.				

4.7.2.2 Project Impacts

Access to the Pier T LNG terminal site would be via Pier T Avenue/Seaside Boulevard.

Construction Impacts (Year 2010)

Cumulative Base Traffic – The POLB and POLA have cargo and traffic projections for the year 2010, the closest base year to the estimated project completion year. The construction analysis is based upon the absolute peak workforce, which would not actually occur in 2010. Hence, the use of this base year produces a conservative traffic impact analysis for construction because the cumulative/background traffic growth is overstated, and the traffic impact criteria are based upon future base traffic conditions. The year 2010 is also used for the operation scenario.

The year 2010 baseline includes all sources of traffic and future growth within and adjacent to the POLB/POLA. Within the Ports' districts, the Ports' year 2010 cargo forecast of 19.7 million twenty-foot

equivalent units (TEUs) were allocated to all container terminals. Future growth in non-container terminal traffic as documented in the POLB/POLA Transportation Study (2001) was also included. The year 2010 baseline traffic volumes also include growth in non-Port traffic through the use of the SCAG's regional model. Additionally the SCAG's model was adjusted to incorporate those proposed/planned developments that were not accurately accounted for in the original SCAG model forecasts. The use of the SCAG model to account for subregional and regional traffic growth beyond the general proximity of the project site is an accepted practice by agencies/jurisdictions. The SCAG model is used for the region's federally required Regional Transportation Plan (RTP), as well as the SIP and the South Coast Air Basin's (SCAB) AQMP.

The Ports' cumulative traffic was estimated and assigned to the roadway system using trip generation rates and the POLB/POLA Transportation Study model.

To accurately forecast future baseline traffic conditions, it is necessary to include planned roadway/rail improvements. Planned and funded roadway/rail improvements that will be in place by 2010 include: the widening of Henry Ford Avenue between Anaheim Street and Alameda Street; the widening of Alameda Street between Henry Ford Avenue and the Pacific Coast Highway; the State Route 47/Henry Ford Avenue/Ocean Boulevard Interchange; and planned City of Los Angeles Department of Transportation (LADOT) improvements at the intersection of Alameda Street and Anaheim Street. The effect of these improvements on lane configurations and LOS can be seen in the LOS worksheets included in Appendix D.

Project Traffic – There would be temporary adverse impacts on project area roadways during site preparation and construction. The duration of construction for the LNG terminal is estimated to be 48 months. During this time, traffic would be generated by trucks transporting materials and equipment to and from the laydown area and project site as well as trucks transporting materials directly to the project site. The designated construction laydown area is located at the northwest quadrant of the Pier S Avenue and Ocean Boulevard intersection (see figure 2.1-1). Driveway access to the laydown area is located along Pier S Avenue. Also, construction worker trips would occur during the construction period.

All construction workers would park adjacent to the laydown area. The construction workers would then be transported via buses to the project site on Pier T. The expected hours of work are 7 a.m. to 3:30 p.m. The absolute peak workforce of 404 was used in this analysis. This peak workforce would occur for 2 months only: months 32 and 33. To emphasize the conservative analysis that was conducted, the following are additional statistics for the workforce projections: average monthly workforce of 252 (62 percent of peak); median workforce of 280 (69 percent of peak); and 85th percentile of 364 (90 percent of peak), which would be only exceeded in 5 months out of 48. Ride-sharing to the worker parking area was not assumed for the workforce, which renders the analysis even more conservative. In summary, 404 auto trips would occur between 6 and 6:30 a.m. (inbound to the laydown/worker parking area), and 4 to 4:30 p.m. (outbound from the laydown/worker parking area). The analysis is conservative in yet another way because the peak hour traffic from all other sources (ports and non-ports) that was used in the analysis was for the 8 to 9 a.m. hour. The cumulative traffic between 6 and 7 a.m. would be much lower. Hence, the analysis overstates the roadway operating conditions and potential impacts. Moreover, it is conceivable that there could be no impacts during the 6 to 7 a.m. hour. Transport of the construction workers between the laydown/worker parking area and the project site would generate 46 bus trips per day (23 in and 23 out) during the most active construction period. It is estimated that 16 bus trips would occur between 6 and 7 a.m., 16 bus trips between 3 and 4 p.m. (assuming 50 people per bus, about 8 bus trips would be required to/from the laydown/worker parking area and the project site), and 14 bus trips between 7 a.m. and 3 p.m. (miscellaneous trips). The distribution/travel routes for construction traffic to/from the laydown/worker parking area and the project site were assumed as follows: 50 percent via

Interstate 710, 25 percent via Interstate 110, and 25 percent via State Route 47. This distribution was developed using data from the POLB/POLA Transportation study and the SCAG regional model.

The transporting of construction equipment and materials would generate approximately 676 daily truck trips (338 in and 338 out) during the most active construction period. Table 4.7.2-6 provides the breakdown of the construction-generated daily and peak hour trips. Table 4.7.2-7 provides intersection LOS for the future conditions with and without the proposed construction traffic for the LNG terminal, and also the change in V/C ratio (delay). The analysis shows that the project construction worker and truck and material haul trips would result in a temporary, short-term significant impact at the following intersections:

- Navy Way and Seaside Avenue – evening only; and
- Henry Ford Avenue and Anaheim Street – evening only.

TABLE 4.7.2-6							
Trip Generation Summary for the Long Beach LNG Import Project LNG Terminal Construction Scenario							
Vehicles	Daily Trips	Morning Peak Hour			Evening Peak Hour		
		In	Out	Total	In	Out	Total
Direct to Project Site							
Trucks (Concrete and Miscellaneous)	108	5	5	10	5	5	10
Trucks (Rock Haul)	528	22	22	44	22	22	44
To Laydown Site							
Autos (Construction Worker)	808	404	0	404	0	404	404
Trucks (Materials and Equipment)	20	1	1	2	1	1	2
Laydown Site to Project Site							
Bus (Construction Worker)	46	8	8	16	8	8	16
Trucks (Materials and Equipment)	20	1	1	2	1	1	2
Total	1,530	441	37	478	37	441	478

Operation Impacts

Project Traffic – Traffic generated by the project was estimated to determine potential impacts of the project on study area roadways. Table 4.7.2-8 provides the project-generated daily and peak hour trips on a typical weekday. The Long Beach LNG Import Project terminal would operate 24 hours a day with four shifts. Employees would generate 120 trips per day or 30 trips per shift. There would be a maximum of 40 LNG truck trips per day.² To be conservative, and not knowing at this time the exact shift times, shift changes were assumed to coincide with the analyzed peak hours. As previously discussed, primary access to the LNG terminal site would be via Pier T Avenue/Seaside Boulevard.

² To be conservative, 20 LNG trucks or 40 LNG truck trips per day were used in the traffic analysis; however, only 16 LNG trucks (32 LNG truck trips) are anticipated.

TABLE 4.7.2-7									
Future 2010 Long Beach LNG Import Project LNG Terminal Construction Scenario - Intersection Level of Service									
Intersection	Future 2010 Base				Future 2010 with LNG Terminal Construction				Significant Impact Impact (Yes/No)
	Morning Peak Hour		Evening Peak Hour		Morning Peak Hour		Evening Peak Hour		
	LOS	V/C or Delay	LOS	V/C or Delay	LOS	V/C or Delay	LOS	V/C or Delay	
1. Terminal Island Freeway Northbound On-Ramp and New Dock Street/Pier S Access Road ^a	A	9	B	11	A	9	B	13	No
2. Terminal Island Freeway Southbound Off-Ramp and New Dock Street ^b	B	11	B	12	B	12	B	13	No
3. Terminal Island Freeway and Ocean Boulevard ^c	A	0.578	C	0.721	B	0.649	C	0.733	No
4. Pier S Avenue and Ocean Boulevard ^c	B	0.649	B	0.678	C	0.717	C	0.747	No
5. Pier S Avenue and New Dock Street ^c	A	0.266	A	0.301	A	0.312	A	0.323	No
6. Pier S Avenue and Depot/SERRF Driveway ^b	A	10	B	11	C	18	B	14	No
7. Navy Way and Seaside Avenue ^c	E	0.934	F	1.033	E	0.937	F	1.060	Yes (evening)
8. Henry Ford Avenue and Terminal Island Freeway On/Off Ramps ^c	A	0.597	B	0.667	B	0.637	B	0.667	No
9. Henry Ford Avenue and Anaheim Street ^c	C	0.729	E	0.930	C	0.760	E	0.973	Yes (evening)
10. Henry Ford Avenue and Deni Street ^c	A	0.374	A	0.374	A	0.399	A	0.399	No
11. Anaheim Street and Alameda Street ^c	A	0.540	B	0.608	A	0.540	B	0.608	No
12. Pacific Coast Highway and Alameda Street east on Alameda Street ^{c, d}	B	0.669	B	0.667	B	0.669	B	0.667	No
13. Pacific Coast Highway and Alameda Street north on Pacific Coast Highway ^{c, d}	A	0.596	B	0.686	A	0.600	B	0.699	No
^a All-way stop-controlled intersection; weighted average delay for entire intersection reported.									
^b Stop controlled on minor street only; delay for most constrained approach is reported.									
^c Signalized intersection.									
^d Analyses assume two intersections due to grade separation of Pacific Coast Highway and Alameda Street per current design plans.									
LOS = Level of Service.									
V/C = Volume-to-Capacity Ratio.									
Delay = Seconds per vehicle.									

Operation Impacts – Table 4.7.2-9 provides intersection LOS forecasts for the future conditions with and without the proposed LNG terminal on Pier T. As shown in table 4.7.2-9, the project would not result in a significant impact on traffic at any of the study intersections.

TABLE 4.7.2-8							
Trip Generation Summary for the Long Beach LNG Import Project LNG Terminal Operation Scenario							
Vehicles	Average Daily Trips	Morning Peak Hour			Evening Peak Hour		
		In	Out	Total	In	Out	Total
Autos	120	15	15	30	15	15	30
LNG Trucks	40	1	1	2	1	1	2
Total	160	16	16	32	16	16	32

TABLE 4.7.2-9										
Future 2010 Long Beach LNG Import Project LNG Terminal Operation Scenario – Intersection Level of Service										
Intersection	Future 2010 Base				Future 2010 with LNG Terminal Construction				Significant Impact (Yes/No)	
	Morning Peak Hour		Evening Peak Hour		Morning Peak Hour		Evening Peak Hour			
	LOS	V/C or Delay	LOS	V/C or Delay	LOS	V/C or Delay	LOS	V/C or Delay		
1. Terminal Island Freeway Northbound On-Ramp and New Dock Street/Pier S Access Road ^a	A	9	B	11	A	9	B	11	No	
2. Terminal Island Freeway Southbound Off-Ramp and New Dock Street ^b	B	11	B	12	B	11	B	12	No	
3. Terminal Island Freeway and Ocean Boulevard ^c	A	0.578	C	0.721	A	0.580	C	0.724	No	
4. Pier S Avenue and Ocean Boulevard ^c	B	0.649	B	0.678	B	0.650	B	0.679	No	
5. Pier S Avenue and New Dock Street ^c	A	0.266	A	0.301	A	0.266	A	0.301	No	
6. Pier S Avenue and Depot/SERRF Driveway ^b	A	10	B	11	A	10	B	11	No	
7. Navy Way and Seaside Avenue ^c	E	0.934	F	1.033	E	0.935	F	1.034	No	
8. Henry Ford Avenue and Terminal Island Freeway On/Off Ramps ^c	A	0.597	B	0.667	A	0.598	B	0.667	No	
9. Henry Ford Avenue and Anaheim Street ^c	C	0.729	E	0.930	C	0.731	E	0.932	No	
10. Henry Ford Avenue and Deni Street ^c	A	0.374	A	0.374	A	0.375	A	0.375	No	
11. Anaheim Street and Alameda Street ^c	A	0.540	B	0.608	A	0.540	B	0.608	No	
12. Pacific Coast Highway and Alameda Street east on Alameda Street ^{c, d}	B	0.669	B	0.667	B	0.669	B	0.667	No	
13. Pacific Coast Highway and Alameda Street north on Pacific Coast Highway ^{c, d}	A	0.596	B	0.686	A	0.597	B	0.686	No	
^a All-way stop-controlled intersection; weighted average delay for entire intersection reported.										
^b Stop controlled on minor street only; delay for most constrained approach is reported.										
^c Signalized intersection.										
^d Analyses assume two intersections due to grade separation of Pacific Coast Highway and Alameda Street per current design plans.										
LOS = Level of Service.										
V/C = Volume-to-Capacity Ratio.										
Delay = Seconds per vehicle.										

Congestion Management Program Analysis

According to the CMP, Traffic Impact Analysis Guidelines, a traffic impact analysis is required at the following:

- CMP arterial monitoring intersections, including freeway on- or off-ramps, where the proposed project would add 50 or more trips during either the morning or evening weekday peak hours; and
- CMP freeway monitoring locations where the proposed project would add 150 or more trips in one direction during either the morning or evening weekday peak hours.

The closest CMP arterial monitoring station to Pier T is Alameda Street/Pacific Coast Highway. It should be noted that according to the CMP requirements, this intersection would not need to be analyzed because less than the threshold number of trips would be added. However, to be conservative in the assessment of potential impacts, this intersection was analyzed. The LOS results in table 4.7.2-9 indicate that this CMP intersection would not be significantly impacted by the project. The closest freeway monitoring stations include Interstate 710 at Willow Street and Interstate 110 at C Street. Per CMP guidelines, an increase of 0.02 or more in the D/C ratio with a resulting LOS F is deemed to be a significant impact. The results of the analysis indicate that the construction and operation scenarios for the proposed LNG terminal would not result in an impact on either of the CMP freeway monitoring locations because less than 150 trips would be generated during the morning or evening peak hours. No other CMP system impacts would result from the project.

Transit Impacts

Although the proposed LNG terminal on Pier T would result in additional on-site employees, the increase in work-related trips using public transit would be negligible. Consequently, additional demand on local transit services would be insignificant.

4.7.2.3 Mitigation

Construction

As previously explained, the construction analysis is conservative and overstated. To mitigate the short-term impacts during the evening peak hour, **the Agency Staffs will recommend to their respective Commissions that the following measure be included as a specific condition of any approvals issued by the FERC and the POLB:**

- **SES shall require that the construction workforce work 6 a.m. to 2:30 p.m. instead of 7 a.m. to 3:30 p.m.**

To assess the effectiveness of the shift change, the 2 to 3 p.m. hour was analyzed, which is also the highest truck peak hour in the Ports. Under this shift schedule, all of the buses are assumed to travel from the Pier T site to the worker parking area between 2:30 and 3 p.m. Also, it was assumed that all of the workers would depart from the parking area before 3 p.m. This approach for the new shift produces a conservative analysis, as some of the trips may in fact occur after 3 p.m.

The 5 to 6 a.m. hour was not analyzed because no impacts are expected. The following briefly summarizes the qualitative analysis conducted to make this assessment:

- There would be no significant construction impacts during the morning commute period.
- Area-wide traffic volumes are very low between 5 and 6 a.m. Recent traffic counts on Ocean Boulevard, the heaviest traveled Ports' area arterial street, indicates that the 5 to 6 a.m. volume is about 50 percent and 40 percent of the 6 to 7 a.m. and 8 to 9 a.m. hours, respectively. Additionally, with the recent implementation of the terminal extended hours program (PierPass), hoot shifts (3 to 8 a.m.) have been eliminated. As a result, there is currently very limited truck traffic between 5 and 6 a.m.

A LOS analysis was conducted to assess the potential impacts of the construction worker shift change. Table 4.7.2-10 provides the intersection LOS results. With the shift change, the impact at the intersection of Navy Way/Seaside Avenue would be removed but the temporary impact at the Henry Ford Avenue/Anaheim Street intersection would remain between 2 and 3 p.m.

TABLE 4.7.2-10					
Future 2010 Long Beach LNG Import Project LNG Terminal Construction Mitigation Scenario – Intersection Level of Service (Mid-Day Peak Hour)					
Intersection	Future 2010 Base		Future 2010 with LNG Terminal Construction		Significant Impact (Yes/No)
	LOS	V/C or Delay	LOS	V/C or Delay	
1. Terminal Island Freeway Northbound On-Ramp and New Dock Street/Pier S Access Road ^a	B	12	B	14	No
2. Terminal Island Freeway Southbound Off-Ramp and New Dock Street ^b	B	14	B	15	No
3. Terminal Island Freeway and Ocean Boulevard ^c	C	0.776	C	0.788	No
4. Pier S Avenue and Ocean Boulevard ^c	B	0.688	C	0.757	No
5. Pier S Avenue and New Dock Street ^c	A	0.280	A	0.344	No
6. Pier S Avenue and Depot/SERRF Driveway ^b	B	10	B	12	No
7. Navy Way and Seaside Avenue ^c	C	0.743	C	0.770	No
8. Henry Ford Avenue and Terminal Island Freeway On/Off Ramps ^c	B	0.615	B	0.656	No
9. Henry Ford Avenue and Anaheim Street ^c	E	0.930	E	0.973	Yes
10. Henry Ford Avenue and Deni Street ^c	A	0.377	A	0.402	No
11. Anaheim Street and Alameda Street ^c	A	0.484	A	0.484	No
12. Pacific Coast Highway and Alameda Street east on Alameda Street ^{c,d}	C	0.716	C	0.716	No
13. Pacific Coast Highway and Alameda Street north on Pacific Coast Highway ^{c,d}	B	0.657	B	0.684	No
^a All-way stop-controlled intersection; weighted average delay for entire intersection reported. ^b Stop controlled on minor street only. ^c Signalized intersection. ^d Analyses assume two intersections due to grade separation of Pacific Coast Highway and Alameda Street per current design plans. LOS = Level of Service. V/C = Volume-to-Capacity Ratio. Delay = Seconds per vehicle.					

The Henry Ford Avenue/Anaheim Street intersection currently operates at a LOS D or better during the typical commute and truck peak hours in the Ports. When intersections are operating at a LOS D or better, improvements are not usually warranted, unless a significant safety hazard exists. Because this impact would be temporary (and the analysis is conservative as previously described), the Port would reassess the LOS and the need for improvements in consultation with the LADOT prior to construction commencing. If the intersection is still operating at a LOS D or better between 2 and 3 p.m., improvements may not be warranted or required by the LADOT.

Another issue to be considered in determining whether or not improvements would be appropriate or warranted is the State Route 47 Expressway Truck Project, proposed by the Alameda Corridor Transportation Authority and CalTrans. This project consists of a four-lane roadway elevated over Henry Ford Avenue and Alameda Street between the Heim Bridge (also proposed to be replaced as part of the project) and Pacific Coast Highway. This improvement project is proposed to be completed by 2011, and if it were completed before the opening of the LNG terminal, then Henry Ford Avenue/Anaheim Street would operate at a LOS C or better, and the improvements described below would not be needed. The status of the State Route 47 Expressway would be considered and discussed with the LADOT before commencement of construction.

However, if the LADOT requires improvements, the following are two options for the Henry Ford Avenue/Anaheim Street intersection:

- Re-stripe the eastbound approach to provide three through lanes. This is consistent with the eastbound departure, which currently has three lanes. Parking is currently prohibited on the eastbound side of Anaheim Street west and east of the intersection. Also, re-stripe the westbound approach to provide two through lanes and a shared through/right turn lane. Re-stripe the westbound departure to provide a third through lane that would merge just prior to Cristobal Avenue. Parking is currently prohibited on the north (westbound) side of Anaheim Street east of Henry Ford Avenue, and during both the morning (7 to 9 a.m.) and afternoon (4 to 6 p.m.) peak hours west of Henry Ford Avenue. The westbound departure re-striping would require either the temporary or permanent removal of two, unmarked parking spaces just west of Cristobal Avenue, which serve a fast food restaurant. This would not cause any impacts because the restaurant has ample off-street parking. The resultant LOS with this improvement would be LOS D (V/C of 0.845); and/or
- Re-stripe the northbound approach to provide two through lanes and a shared through/right turn lane. Also re-stripe the northbound departure to provide the third through lane that would merge just prior to I Street. This would require a parking prohibition on the east (northbound) side of Henry Ford Avenue between Anaheim Street and I Street. However, no impacts would occur because this curb face is not used for parking because the fronting lot is vacant. The resultant LOS with this improvement would be LOS D (V/C of 0.886).

Implementation of the mitigation measures described above would reduce the impacts of the project on ground transportation to less than significant levels.

4.7.3 Marine Transportation

4.7.3.1 Environmental Setting

In total, the POLB has some 17 miles of berthing frontage for commercial vessels with 157 named berths. There are 77 deep-water berths and all berths lie within 4.5 nautical miles (nm) of the open sea. Containers are the primary cargo moving through the Port with major container terminals at Piers A, F, G, J, and T, as well as a proposed development at Pier S. Bulk oil and products cargo are located at Piers B, C, and T and dry bulk cargo at Pier F. The other cargoes moving through the POLB include refrigerated cargo at Pier E, forest products at Piers D and T, and scrap metal recycling and export at Pier T.

Commercial ship traffic generally approaches the POLB from the northwest passing north of Catalina Island and from the south passing east of the island using established commercial shipping lanes. Vessels enter the area through Queens Gate, a 1,200-foot-wide opening into San Pedro Bay between the Long Beach and Middle breakwaters. To access Pier T, vessels travel northwest within the Long Beach Main Channel into the Middle Harbor. Pier T is located within the West Basin of the Middle Harbor. Commercial traffic passes east of Pier T to the container, tanker, and other berths of the East Basin and Back Channel. Tankers chartered by the Navy occasionally use the West Basin to access its fuel pier on the Navy Mole. Container traffic also enters the West Basin to access a recently opened container terminal at Pier T. The general arrangement of the POLB is shown on figure 4.7.3-1.

There are no commercial anchorages located within the West Basin but two anchorages are located within the breakwater and precautionary area of the Port. There is one anchorage area to the east of the channel and one to the west. The anchorage to the east has 18 locations and there are 7 to the west. There are 28 commercial anchorages located within the enclosed waters of San Pedro Bay (16 to the east and 12 to the west of the channel). Additional anchorages are located in open water outside of the Queens Gate entrance.

High density commercial fishing does not occur within the approaches to the POLB or within the Port limits. There are two marinas in the City of Long Beach located east of the harbor limit and several marinas in the East Basin of the Cerritos Channel. Recreational boats use the waterway to Queens Gate to access and exit the area and use San Pedro Bay inside the breakwater as a cruising area. There is very little recreational traffic inward of the cut at Pier F and recreational boating is not allowed within the West Basin of the Middle Harbor.

Vessel traffic in the San Pedro Bay area is controlled through a single VTS located at Point Fermin to the west of the ports of Long Beach and Los Angeles. The purpose of the VTS is to enhance safe, environmentally sound, and efficient maritime transportation. Once a vessel enters Queens Gate, the responsibility for vessel traffic management is transferred from the VTS to the Long Beach pilot service. The Long Beach pilot service is managed by Jacobsen Pilots from its control station at Pier F. A detailed description of the VTS and the pilot service is provided in section 4.11.7.

Information on ship calls (i.e., a visit to the Port that combines arrival, time at berth, and departure) and ship movements (i.e., a single transit inwards from the sea, a shift within the Port, or a departure transit) within the POLB is maintained by both the Marine Exchange and Jacobsen Pilots. The Marine Exchange records ship calls for both the POLA and POLB. Jacobsen Pilots records ship movements within the POLB.

Current Traffic Levels

The POLB currently experiences about 3,085 ship calls, which result in about 6,170 inward and outward ship movements per year. An additional 2,230 internal movements where vessels shift berth or location within the Port were recorded in 2004. Between 8 and 39 ship movements per day can occur within the Port, with an average of 20 ship movements per day. The majority of ship movements to and from the berths are completed in 2 hours or less and very few movements are greater than 3 hours in duration. The present level of ship movements has been sustained over the previous 5 years. The pilot service and tug assistance can routinely handle up to 25 ship movements per day and can handle peaks of 30 to 40 ship movements per day.

Non-Internet Public

DRAFT ENVIRONMENTAL IMPACT STATEMENT/ENVIRONMENTAL IMPACT REPORT FOR THE LONG BEACH LNG IMPORT PROJECT

Docket No. CP04-58-000, et al.

Page 4-90
Figure 4.7.3-1

Public access for the above information is available only
through the Public Reference Room, or by e-mail at
public.referenceroom@ferc.gov

Future Traffic Levels

The demand for containerized cargo capacity is expected to increase to between 5,200 and 7,600 ship calls in 2020. This would result in between 10,400 and 15,200 inward and outward ship movements in 2020, which would translate to one ship movement every 50 minutes (low estimate) or 35 minutes (high estimate). The ability of the POLB to handle increasing numbers of ships associated with various trades depends on the capacity of primary and secondary factors that can limit vessel traffic. Primary factors are those features of the Port that cannot be changed, or can be changed or modified only with very high capital expenditure, including the breakwater entrance, channel depth, channel geometry, and/or environmental conditions. Secondary factors are those features of the Port that can be changed or modified at modest capital or operational expenditure, including pilotage and towage services. Of the primary factors, the breakwater entrance is wide enough to accept two-way traffic and is unlikely to be a constraint on capacity. The water depth in the outer harbor is about 70 feet and in the inner basins is about 40 to 60 feet.

4.7.3.2 Impact and Mitigation

The Long Beach LNG Import Project would generate a maximum of 120 ship calls and 240 ship movements within the POLB each year. This would typically mean the addition of one ship movement per day on up to 240 days of the year or possibly two ship movements in the event of a rapid discharge call with arrival, discharge, and departure occurring during one calendar day.

While SES anticipates receiving LNG vessels with capacities up to 145,000 cubic meters for the foreseeable future, the terminal is being designed to accommodate vessels with capacities ranging between 75,000 and 208,000 cubic meters. Based on a typical Port transit speed of 6 knots, the transit time through the Port to the terminal would be about 2 hours, regardless of the vessel size. The time required to unload the LNG cargo would range between 6 and 18 hours based on the vessel's LNG capacity. An LNG vessel with a capacity of 145,000 cubic meters would take approximately 12 hours to unload.

The increase in ship traffic associated with the LNG terminal could cause congestion within the harbor and/or conflicts with other commercial interests if an LNG ship arrival or departure delays the movement of another vessel, either due to scheduling or traffic management resulting in slow speed or waiting time. A Shipping Study was conducted to determine the effects of LNG-related ship traffic on POLB operations. This study is available for viewing on the FERC Internet website and at the POLB offices in Long Beach.³ The results of the study are summarized below.

The Shipping Study identified the Middle Harbor as an area of potential congestion and/or delay during an LNG ship turn or swing on its inward or outward transit. The addition of a maximum of 120 ship calls and 240 ship movements per year would represent around a 4 percent increase over the total current levels of ship traffic and about 2 percent of the total projected levels in 2020. The 240 ship movements added to the existing 1,800 ship movements in the Middle Harbor would result in about a 12 percent increase over 2004 figures. Estimated delay times were analyzed using a triangular distribution in a Monte Carlo simulation over 10,000,000 iterations, equivalent to the maximum 240 ship movements per year over 30 years. On the occasion when an LNG ship is to move at about the same time as another vessel, the potential delay is almost zero if the traffic is well scheduled, about 10 minutes if the LNG ship is not turning/swinging, and a maximum of 30 minutes if it is turning/swinging in the Middle Harbor. In

³ This study is included as Appendix 11-2 of Resource Report 11 on the FERC Internet website (<http://www.ferc.gov>). Using the "eLibrary" link, select "General Search" from the eLibrary menu and enter the docket number excluding the last three digits in the "Docket Number" field (i.e., CP04-58). Be sure to select an appropriate date range. Copies are also available for viewing at the POLB's offices at 925 Harbor Plaza, Long Beach, California.

total, there is a 10 percent probability that any delay would be less than 5 minutes and 90 percent probability that any delay would be less than 22 minutes.

It is possible that the container ships would take commercial priority and any delay would then fall on the LNG ships. However, if delays were experienced by other ships, the delays are expected to be temporary and of short duration. In addition, SES would participate with the Coast Guard in the development of procedures to reduce impacts on marine transportation, including implementation of an LNG Vessel Operation and Emergency Contingency Plan that would provide the basis for operation of LNG ships within the POLB (see section 4.11.7). As a result, ship traffic associated with the Long Beach LNG Import Terminal would not cause significant vessel traffic congestion within the harbor and would not exceed the capacity for maritime commerce to operate efficiently and safely within the POLB.

Several scoping comments were received about the potential effects of the security zone that would be enforced around the LNG ships on other commercial vessels, including commercial fishing, within the POLB. The Coast Guard, with the assistance of the POLB, would enforce the Title 33 CFR Part 165.1151 moving security zone of 1,000 yards ahead and 500 yards on each side and astern of the LNG ships. The Coast Guard and the HSC already require ships moving within the precautionary area (i.e., the area extending 8 nm south of the Queens Gate entrance to the southern marine traffic separation scheme and 10 nm to the southwest to the western marine traffic separation scheme) and inside the breakwaters of the POLB to maintain a minimum separation distance of 500 yards. The additional 500 yards enforced ahead of an LNG ship should not cause any significant impacts on other commercial vessels within the POLB. In addition, because high density commercial fishing does not occur within the approaches to the POLB or within the Port limits, no impacts on the commercial fishing industry are anticipated. Additional information on marine safety procedures within the POLB and specific LNG ship safety procedures is presented in section 4.11.7.

There would be no impact on ship traffic within the Cerritos Channel because the pipelines would be installed under the channel using the HDD construction method. There would be no impact on ship traffic within the Dominguez Channel because ships do not use the portion of the channel that would be crossed by the C₂ pipeline and the pipeline would be installed on an existing pipe bridge.

4.7.4 Air Transportation

4.7.4.1 Environmental Setting

The Long Beach Airport is located about 5.7 miles north-northeast of the LNG terminal site. This is a centrally located alternative airport for travel in and out of Los Angeles and north Orange County. The airport is serviced by a number of carriers that offer daily flights to major cities throughout the United States. The Long Beach Airport has two north-south runways, two west-east runways, and a northwest-southeast runway.

The Los Angeles International Airport is located about 17.0 miles north-northwest of the LNG terminal site and is one of the busiest airports in the United States. All of the runways trend west-east.

4.7.4.2 Impact and Mitigation

The two LNG storage tanks would be the tallest and most prominent structures associated with the Long Beach LNG Import Project and would be among the largest structures in the Long Beach area. Each tank would be about 255 feet wide and 176 feet tall. By comparison, the cranes used to unload the container ships on Piers A, T, E, and J in the POLB and throughout the POLA are between 250 and 300 feet tall. Because the LNG storage tanks would be no taller than the cranes currently operating at the ports, the project would not result in a permanent change in air traffic patterns or affect current or future operations at either the Long Beach or Los Angeles International Airports.

4.8 CULTURAL RESOURCES

4.8.1 Significance Criteria

Impacts on cultural resources would be considered significant if project construction or operation would result in an unresolvable adverse effect on the characteristics that contribute to the eligibility of a historic or prehistoric property for the National Register of Historic Places (NRHP) (for federal undertakings) or the California Register of Historical Resources (CRHR) (for purposes of the CEQA). In addition, under the CEQA impact on some cultural resources besides those listed or eligible for listing on the CRHR must also be considered.

Adverse effects may include, but are not limited to, the following:

- physical destruction of or damage to all or part of the property (historic resource);
- change in the character of the property's use or of physical features within a property's setting that contribute to its historic significance (e.g., by isolating the property from its setting); and
- introduction of visual, atmospheric, or audible elements that diminish the integrity of the property's significance.

4.8.2 Regulatory Requirements

4.8.2.1 Federal

The FERC is responsible for complying with section 106 of the NHPA, which requires federal agencies to take into account the effects of their undertakings on historic properties and afford the Advisory Council on Historic Preservation (ACHP) an opportunity to comment. The procedures for complying with section 106 are outlined in the ACHP's regulations (Title 36 CFR Part 800). The effects of the project on properties of traditional religious and cultural importance to Native Americans must also be considered in accordance with section 101 (d)(6) of the NHPA and the American Indian Religious Freedom Act. The FERC meets its responsibilities in consultation with the State Historic Preservation Office (SHPO). SES, as a non-federal party, is assisting the FERC in meeting its obligations under section 106 and the implementing regulations in Title 36 CFR Part 800.

In evaluating cultural resources, several criteria are considered. First, significant cultural resources (as defined for federal undertakings) include those prehistoric and historic sites, districts, buildings, structures, and objects, as well as properties with traditional religious or cultural importance to Native Americans or other groups, that are listed, or are eligible for listing, on the NRHP (historic properties) according to the criteria outlined in Title 36 CFR Part 60.4. Second, cultural resources that do not meet the NRHP criteria but may qualify as a unique characteristic of an area are considered under the NEPA.

4.8.2.2 CEQA

The POLB is responsible for complying with all provisions of the CEQA covering cultural resources, including CEQA sections 21083.2 and 21084.1, and section 15064.5 of the *Guidelines for Implementation of the CEQA*. The POLB meets its responsibilities in consultation with the SHPO.

Cultural resources include prehistoric and historic-period archaeological sites, districts, and objects; standing historic structures, buildings, districts, and objects; and locations of important historic events or sites of traditional/cultural importance. CEQA section 15064.5 indicates a project may have a significant environmental effect if it causes “substantial adverse change” in the significance of a historical resource. A historical resource is considered significant if it meets the criteria for listing on the CRHR as defined in section 15064.5(a)(1) through (a)(4).

The POLB is also required to take into account the effect on properties that meet the definition of a unique archaeological resource in CEQA section 21083.2. Under the CEQA, archaeological resources are sometimes treated differently than “historical resources.” Thus, it is important to first determine whether certain archaeological sites are “historical resources” for purposes of the CEQA. An archaeological resource is considered a historical resource when it is listed, or determined eligible for listing, on the CRHR, included in a local register of historical resources, or identified as significant in a historical resource survey. For archaeological resources that are not “historical resources,” it must then be determined if they are “unique” archaeological resources according to Public Resources Code 21083.2(g). The distinction may be important because mitigation measures sometimes differ for archaeological and historical resources.

4.8.3 Cultural Resources Assessment

As part of its applications, SES provided the FERC and the POLB with its cultural resources assessment of the project area, including its literature review and the status of previous cultural resources surveys. In addition, SES provided its initial contacts with the SHPO and Native American tribes (see section 4.8.5) and its Unanticipated Discovery Plan (see section 4.8.4). In October 2004, SES provided additional information regarding its proposed C₂ pipeline.

SES’ literature review indicated that previous surveys and evaluations conducted for the decommissioning of the Long Beach Naval Shipyard during the 1990s identified no NRHP-eligible structures or archaeological resources on the LNG terminal site. Nine previously recorded cultural resources sites were identified within 1 mile of the LNG terminal site, the natural gas pipeline route, the portion of the C₂ pipeline route adjacent to the natural gas pipeline route, the construction laydown and worker parking area, and the electric distribution facilities. Six of these cultural resources are located more than 500 feet from the project facilities and would not be affected by construction or operation of the project. One resource, the dry dock hanger used to house Howard Hughes’ Flying Boat H-K 1 after its flight in 1947, no longer exists, having been dismantled in 1981. Therefore, this cultural resource would not be affected. One resource, consisting of two abandoned oil wells located within 150 feet of the proposed electric distribution lines, was recommended as not eligible for listing on the NRHP. The remaining site, the Edison Power Station (now known as the Long Beach Generating Station) and associated transmission towers, was recommended as eligible for listing on the NRHP. The power station has been decommissioned. Although the transmission towers are still in operation, construction and operation of the project facilities would avoid the NRHP-eligible portions of the towers. In addition, three previously recorded cultural resources were identified within 0.25 mile of the portion of the C₂ pipeline route that would not be adjacent to the natural gas pipeline route. Two of these resources are located more than 500 feet from the project facilities and would not be affected by construction or operation of the project. The remaining resource, the Kinder Morgan Tank Storage Terminal, is located adjacent to the proposed C₂ pipeline route and was recommended as not eligible for listing on the NRHP.

The pipeline and electric distribution facilities would be constructed in areas that have undergone extensive previous disturbance. Accordingly, the Agency Staffs have determined that no surveys would be required because the likelihood that cultural resources would be encountered is considered low.

SES would use a previously disturbed area within the POLB as a laydown and worker parking area during construction. The area is graveled and would not require subsurface disturbance. Accordingly, no cultural resources surveys would be required for the use of this area.

In-water activities associated with the project would consist of reinforcement of the shoreline structures, construction of the ship berth and unloading facility, and associated dredging adjacent to Pier T within the West Basin. The area has been dredged multiple times within the past 100 years and there are no recorded underwater cultural resources present. Accordingly, no underwater cultural resources surveys would be required for the in-water activities adjacent to Pier T.

Cultural resources that are eligible for listing on the NRHP are also eligible for listing on the CRHR. The POLB has reviewed the remaining cultural resources (i.e., the Edison Power Station and towers) and determined that the project would have no effect on these historical resources under the CEQA. In addition, sites that are not eligible for listing on the NRHP may be eligible for listing on the CRHR. The POLB has reviewed the resources consisting of two abandoned oil wells and the Kinder Morgan Tank Storage Terminal that are not eligible for listing on the NRHP and determined that these resources are not eligible for listing on the CRHR. No unique archaeological resources were discovered during previous surveys.

In letters dated January 9, 2004 and April 20, 2005, the SHPO commented that no historic properties would be affected by the originally proposed project and the proposed C₂ pipeline. The FERC and the POLB concur.

4.8.4 Unanticipated Discoveries

SES prepared an Unanticipated Discovery Plan to be used during construction. The plan describes the procedures that would be employed in the event previously unidentified cultural resources or human remains are encountered during construction. The procedures in the Unanticipated Discovery Plan differ whether the find is a cultural resource or human remains. In the event a new cultural resource is discovered, procedures would include: stopping work in the vicinity of the find; examination of the find by a qualified archaeologist; documentation of the find to determine its significance; providing an initial discovery report to the FERC, the POLB, and the SHPO that includes recommendations for further work; and procedures to resume work after any required testing or mitigation is complete. The procedures to be followed in the event that human remains are discovered would be similar to those described above, but would also include additional consultations with the Native American Heritage Commission (NAHC) and Native American tribes that are identified by the NAHC. In a letter dated January 9, 2004, the SHPO accepted the Unanticipated Discovery Plan. The FERC reviewed the plan and requested revisions; SES provided a revised plan, which the FERC and the POLB find acceptable.

4.8.5 Native American Consultation

SES contacted 15 Native American tribes⁴ who were identified by the California NAHC as potentially having knowledge of cultural resources in the project area. SES sent initial consultation letters to the 15 tribes on September 19, 2003. These letters described the project and provided the tribes with the opportunity to comment on the project and its potential impacts on traditional cultural properties and

⁴ Coastal Gabrieleno Diegueno (Jim Velasques), Samuel H. Dunlap, Gabrielino Band of Mission Indians of California (Susan Frank), Gabrielino Tongva (Craig Torres), Gabrielino Tongva Indians of California Tribal Council (Robert F. Dorame, Chairperson), Gabrielino/Tongva Council/Gabrielino Tongva Nation, Gabrieleno/Tongva Tribal Council (Anthony Morales, Chairperson), Ish Panesh United Band of Indians (John Valenzuela), Island Gabrielino Group (John Jeffredo), Juaneno Band of Mission Indians (Anita Espinoza), Juaneno Band of Mission Indians (Sonia Johnston, Chairperson), Juaneno Band of Mission Indians Acjachemen Nation (David Belardes, Chairperson), Juaneno Band of Mission Indians Acjachemen Nation (Damien Shilo, Chairman), Los Angeles City/County Native American Indian Commission, and Ti'At Society (Cindi Alvitre).

historic properties. Only the Gabrieleno/Tongva Tribal Council responded. The Tribal Council Chairperson (Anthony Morales) indicated that Native American human remains have previously been discovered in deposits that were considered disturbed, inquired whether a Native American or archaeological monitor would be present during construction, and requested continued consultation regarding the project.

On December 8, 2003, SES sent follow-up letters to tribes that had not yet responded to its initial consultation letter. No responses have been received. On February 18, 2005, SES sent a follow-up letter to the NAHC regarding the C₂ pipeline. The NAHC responded on February 18, 2005 that a records search of the sacred land file had not identified the presence of Native American cultural resources in the vicinity of the proposed project. In addition, on February 21, 2005, SES sent follow-up letters to the tribes regarding the C₂ pipeline. No responses have been received. SES stated that it would conduct follow-up telephone contacts with the tribes in the event no responses are received. SES' continued cooperation with these tribes should address any tribal issues associated with the proposed project.

4.8.6 Impact and Mitigation

The FERC and the POLB, in consultation with the SHPO, have determined that there would be no impact on any properties listed, or eligible for listing, on the NRHP or the CRHR or on any unique archaeological resources for the proposed project; therefore, no mitigation would be required.

4.9 AIR QUALITY

4.9.1 Significance Criteria

Impacts on environmental air quality levels would be considered significant if:

- the project construction or operational emissions would exceed the significance thresholds for criteria air pollutants listed in the SCAQMD *CEQA Air Quality Handbook* (see table 4.9.1-1);
- the project would contribute to a new violation, or worsen an existing violation, of an ambient air quality standard;
- the cancer risk significance threshold listed in the SCAQMD *CEQA Air Quality Handbook* would be exceeded (see table 4.9.1-2);
- the cancer burden and noncancer risk significance thresholds listed in the SCAQMD Rule 1401 would be exceeded (see table 4.9.1-2);
- the project would not comply with the SCAQMD requirement of consistency with new control measures contained in the 2003 AQMP;
- the project would not comply with the federal requirement of the applicable SIP as defined in section 176(c) of the federal CAA Amendments of 1990; or
- the project would create objectionable odors that affect a substantial number of people.

TABLE 4.9.1-1							
SCAQMD Emission Significance Thresholds for Criteria Air Pollutants							
Emission Type	Emission Period	Units	Emission Rate				
			NO _x	ROC	PM ₁₀	SO _x	CO
Project Construction	Daily	pounds per day	100	75	150	150	550
	Quarterly	tons per quarter	2.5	2.5	6.75	6.75	24.75
Project Operations	Daily	pounds per day	55	55	150	150	550

Source: SCAQMD *CEQA Air Quality Handbook*, 1993.

TABLE 4.9.1-2	
SCAQMD Significance Thresholds for Toxic Air Contaminants	
Health Risk Criterion	Significance Threshold
Individual Lifetime Cancer Risk	10 in 1 million (1×10^{-5})
Cancer Burden	0.5
Acute Noncancer Health Hazard Index	1.0
Chronic Noncancer Health Hazard Index	1.0

Source: SCAQMD Rule 1401.

4.9.2 Environmental Setting

4.9.2.1 Topography and Climate

The POLB is located in San Pedro Bay in the southwestern portion of the SCAB (see figure 4.9.2-1). The climate in the project area is classified as a Mediterranean type of air mass, which is characterized by warm, rainless summers and mild, wet winters. The regional climate is complex and the major influences are the Eastern Pacific High (a strong persistent area of high atmospheric pressure over the Pacific Ocean), topography, and the moderating effects of the Pacific Ocean. Seasonal variations in the position and strength of the Eastern Pacific High are a key factor in weather changes in the area.

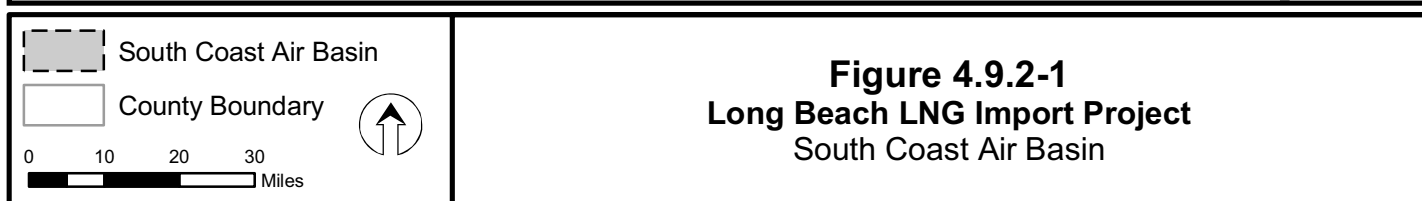
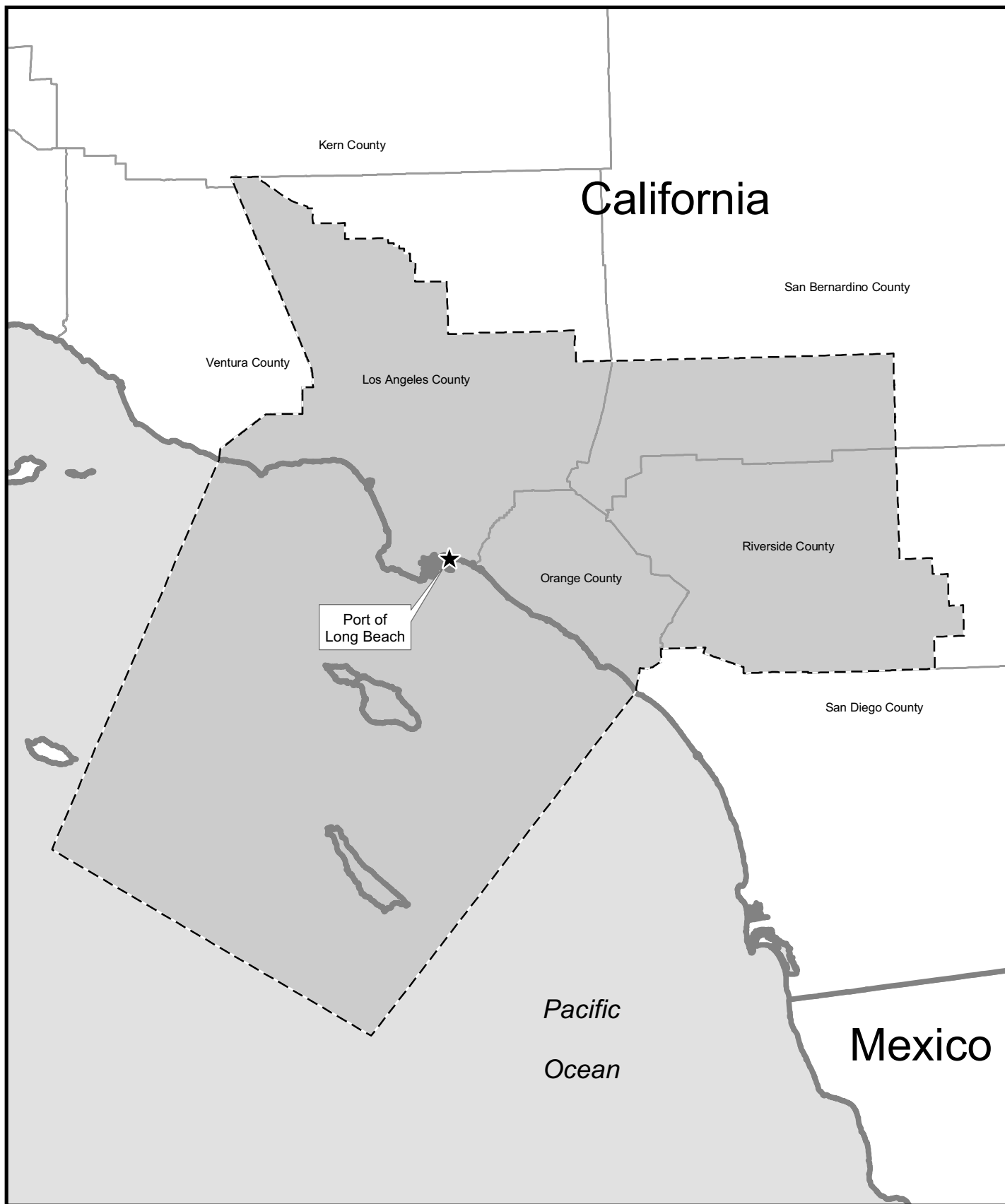
The Eastern Pacific High attains its greatest strength and most northerly position during the summer, when it is centered west of northern California. In this location, it effectively blocks and shelters southern California from the effects of cooler polar storm systems. However, large-scale atmospheric subsidence associated with the Eastern Pacific High produces an elevated temperature inversion along the West Coast. Inversions of this type are typically shallow from 1,000 to 2,500 feet above msl during the summer. The inversion limits vertical mixing of the atmosphere and essentially traps air pollutants in the lower atmosphere. The mountain ranges that surround the LA Basin constrain the horizontal movement of air and also inhibit the dispersion of air pollutants out of the region. These two factors, combined with the air pollution sources of over 15 million people, are responsible for the high pollutant conditions that can occur in the SCAB during the summer months. In addition, the warm temperatures and high solar radiation during the summer months promote the formation of ozone, which is at its highest levels during the summer.

During the fall and winter months, the Eastern Pacific High can combine with high pressure over the continent to produce light winds and extended inversion conditions in the region, creating stagnant atmospheric conditions that often result in adverse pollutant concentrations in the SCAB. However, some dispersion relief may occur under these conditions as excessive high pressure builds up in the Great Basin region to produce a “Santa Ana” condition. A Santa Ana condition is characterized by warm, dry, northeast winds in the SCAB and offshore regions. The presence of Santa Ana winds often ventilates the SCAB of air pollutants and assists in movement and dispersion of those air pollutants.

A sea breeze regime prevails within the project area for most of the year, particularly during the spring and summer months, as a result of the Eastern Pacific High and a thermal low pressure system in the desert interior to the east. These sea breezes are a diurnal occurrence and assist in increasing atmospheric pollutant dispersion. Sea breezes within San Pedro Bay typically increase during the morning hours from the southerly direction and reach a peak in the afternoon as they blow from the southwest. These winds generally subside after sundown. During the colder months of the year, northerly land breezes increase by sunset and into the evening hours. Sea breezes transport air pollutants away from the coast and toward the interior regions in the afternoon hours for most of the year, which may concentrate atmospheric pollutants near the mountains where they become trapped due to topographic effects.

4.9.2.2 Ambient Air Quality

The EPA has established the NAAQS for several common air pollutants, known as criteria pollutants. Criteria pollutants include ozone, carbon monoxide (CO), nitrogen dioxide (NO₂), SO₂, PM₁₀, particulate matter having an aerodynamic diameter of 2.5 microns or less (PM_{2.5}), and lead. The NAAQS were set at levels the EPA believed were necessary to protect human health and welfare. For most pollutants, maximum concentrations may not exceed the NAAQS more than once per year and they may never exceed the annual NAAQS.



Similarly, the CARB has established the California Ambient Air Quality Standards (CAAQS), which are generally more stringent and include more pollutants than the NAAQS. Maximum pollutant concentrations may not equal or exceed the CAAQS.

The SCAQMD operates numerous ambient air monitoring stations within the SCAB. The monitoring station closest to the proposed project facilities is at the Long Beach Airport, located approximately 5.7 miles to the north-northeast. This station is considered to be the most representative of the project area. Table 4.9.2-1 compares monitoring data measured between 1999 and 2002 at the Long Beach Airport station to the NAAQS and CAAQS.

TABLE 4.9.2-1							
Maximum Pollutant Concentrations Measured at the Long Beach Airport Monitoring Station							
Pollutant	Averaging Period	NAAQS	CAAQS ^a	Highest Monitored Concentration ^b			
				1999	2000	2001	2002
Ozone (ppmv)	1 hour	0.12	0.09	0.13 ^c	0.12 ^c	0.09	0.08
	8 hours	0.08	NA	0.08	0.080	0.070	0.065
CO (ppmv)	1 hour	35	20	7	10	6	6
	8 hours	9	9	5.4	5.8	4.7	4.6
NO ₂ (ppmv)	1 hour	NA	0.25	0.15	0.14	0.13	0.13
	Annual	0.053	NA	0.0342	0.0313	0.0308	0.03
SO ₂ (ppmv)	1 hour	NA	0.25	0.05	0.05	0.05	0.03
	24 hours	0.14	0.04	0.011	0.014	0.012	0.008
	Annual	0.03	NA	0.0027	0.0015	NA	NA
PM ₁₀ (µg/m ³)	24 hours	150	50	79.0 ^d	105.0 ^d	91.0 ^d	74 ^d
	Annual arithmetic mean	50	20	38.9	37.6	37.4	35.9
PM _{2.5} (µg/m ³)	24 hours	65	NA	66.9 ^e	81.5 ^e	72.9 ^e	62.7
	Annual arithmetic mean	15	12	21.5	19.2	21.4	19.5
Lead (µg/m ³)	30 days	NA	1.5	0.06	0.05	0.05	0.03
	Calendar quarter	1.5	NA	0.05	0.04	0.04	0.02
Sulfates (µg/m ³)	24 hours	NA	25	13.7	26.7 ^f	15.9	17.8
^a CAAQS have also been established for vinyl chloride, hydrogen sulfide, and visibility reducing particles; however, these pollutants are not monitored at the Long Beach Airport station. ^b Exceedances of the standards are highlighted in bold. ^c The national 1-hour ozone standard was exceeded on 1 day in 1999. The state 1-hour ozone standard was exceeded on 3 days in 1999 and 3 days in 2000. ^d The state 24-hour PM ₁₀ standard was exceeded on 13 of 59 sampled days in 1999, 12 of 57 sampled days in 2000, 10 of 59 sampled days in 2001, and 5 of 58 sampled days in 2002. ^e The national 24-hour PM _{2.5} standard was exceeded on 1 of 148 sampled days in 1999, 4 of 304 sampled days in 2000, and 1 of 317 sampled days in 2001. ^f The state 24-hour sulfates standard was exceeded on 1 day in 2000. ppmv = parts per million by volume µg/m ³ = micrograms per cubic meter NA = Not applicable Source: SCAQMD (www.aqmd.gov).							

As shown in table 4.9.2-1, recent ambient air concentrations at the Long Beach Airport exceeded the standards for ozone, PM₁₀, and PM_{2.5}. This is consistent with most of the monitoring stations in the SCAB. The sulfates standard was also exceeded on 1 day over the past 3 years. No standards were exceeded for the remaining monitored pollutants.

Although there are no NAAQS or CAAQS for reactive organic compounds (ROC) or NO_x (one component of which is NO₂), these pollutants are regulated because they are precursors to ozone; that is, they react to form ozone in the presence of sunlight through a complex series of photochemical reactions.

4.9.2.3 Attainment Status

The EPA designates all areas of the United States according to whether they meet the NAAQS. A non-attainment designation means that a primary NAAQS has been exceeded more than once per year in a given area. The SCAB was designated as an “extreme” non-attainment area for the 1-hour ozone standard until the standard was revoked by the EPA on June 15, 2005. The EPA currently designates the SCAB as a “serious” non-attainment area for both CO and PM₁₀ but is considering reclassifying the SCAB as attainment for CO because it is currently meeting the standards. In July 1997, the EPA established a new federal 8-hour standard for ozone and revised the NAAQS for particulate matter to add new standards for PM_{2.5}. On April 15, 2004, the EPA designated the SCAB as a “severe” non-attainment area for the 8-hour ozone standard and on April 5, 2005 the SCAB was designated as a non-attainment area for PM_{2.5}. The SCAB is designated in attainment of the NAAQS for SO₂, NO₂, and lead. Similarly, the CARB designates areas of the state according to whether they meet the CAAQS. A non-attainment designation means that a CAAQS has been exceeded more than once in 3 years. The CARB currently designates the SCAB as an “extreme” non-attainment area for ozone, a “severe” non-attainment area for CO, and a non-attainment area for PM₁₀. The SCAB is in attainment of the CAAQS for SO₂, NO₂, lead, and sulfates; and unclassified for all other pollutants.

4.9.2.4 Air Quality Management Plan

In federal non-attainment areas, the CAA requires preparation of a SIP that details how the state will attain the NAAQS within mandated time frames. In response to this requirement, the SCAQMD and the SCAG adopted the 2003 AQMP. The focus of the 2003 AQMP is to demonstrate attainment of the federal PM₁₀ standard by 2006 and the federal 1-hour ozone standard by 2010, while making expeditious progress toward attainment of state standards. Although the EPA revoked the 1-hour ozone standard on June 15, 2005, the existing SIP’s control measures and budgets developed to demonstrate attainment with the 1-hour standard are still applicable to sources in the SCAB. A SIP demonstrating attainment with the 8-hour ozone standard will be developed and adopted by the SCAQMD and the CARB and submitted to the EPA for approval by June 15, 2007. Because the SCAB is on the verge of attaining the federal CO standard, the AQMP also replaces the 1997 attainment demonstration for the federal CO standard and provides a basis for a maintenance plan for CO in the future (SCAQMD, 2003a).

4.9.2.5 Toxic Air Contaminants

Toxic air contaminants are present in the atmosphere in trace concentrations but are not regularly monitored in the SCAB. Most of the available monitoring data for toxic air contaminants were generated during the Multiple Air Toxics Exposure Study in the SCAB (MATES II Study) that was conducted in 1997 (SCAQMD, 1999). The key air toxic contaminants monitored in the MATES II Study are presented in table 4.9.2-2.

The MATES II Study found that the average carcinogenic (i.e., cancer) risk throughout the SCAB from exposure to toxic air contaminants is about 1,400 in 1 million ($1,400 \times 10^{-6}$). At the monitoring station closest to the project area, the MATES II Study estimated the cancer risk to be approximately 1,200 in 1 million ($1,200 \times 10^{-6}$). The MATES II Study found that mobile sources (e.g., cars, trucks, trains, ships, aircraft) were the largest contributors to this risk. About 70 percent of the risk was attributed to diesel particulate emissions, 20 percent to other toxics associated with mobile sources (e.g., benzene,

1,3-butadiene, formaldehyde), and 10 percent to stationary sources (e.g., dry cleaners and chrome plating operations).

TABLE 4.9.2-2	
Key Air Toxic Contaminants Monitored in the MATES II Study and their Contribution to the Ambient Cancer Risk	
Toxic Air Contaminant	Risk Contribution (percent) ^a
Diesel particulate	72.0
1,3-butadiene	8.4
Benzene	6.5
Formaldehyde	2.0
Hexavalent chromium	1.8
Perchloroethylene	0.8
Para-Dichlorobenzene	0.7
Acetaldehyde	0.6
Methylene chloride	0.2
Nickel	0.2
Trichloroethylene	0.1
^a Based on an eight station average from the MATES II Study.	

A regional modeling study was also conducted as part of the MATES II Study. The results of the modeling study suggest that the basin-wide cancer risk level may be 16 percent lower than the corresponding risk levels estimated from the regional monitoring sites. According to the SCAQMD, the results of the modeling study also indicate that higher risk levels occur in the south-central Los Angeles area, the harbor area, and near freeways.

The MATES II study identified long-term downward trends of cancer risk levels in the SCAB and specifically in Long Beach, with a decrease of approximately 50 percent in toxic levels from 1990 to 1997. Diesel particulate matter was identified as the most significant contributor to the predicted cancer risks, with southern California having a decrease of approximately 32 percent in elemental carbon (a surrogate for diesel particulates) from the early 1980s to the early 1990s (POLB, 2002).

4.9.2.6 Baseline Site Emissions

The proposed LNG terminal site is currently paved with concrete and asphalt and contains two abandoned buildings. As a result, baseline emissions at the project site are assumed to be zero.

4.9.2.7 Sensitive Receptor Locations

When assessing air quality, it is important to consider the impacts on individuals especially sensitive to air pollution, such as children, the elderly, and the infirm. Sensitive receptors could be present at residences, schools, daycare centers, convalescent homes, and hospitals. The nearest sensitive receptors to the project facilities are potential residences in a recreational vehicle park about 1.3 miles east-northeast of the LNG terminal site, possible live-aboard boats at two marinas in the East Basin of the Cerritos Channel between 1.2 and 1.6 miles northwest of the LNG terminal site, and Edison Elementary School about 1.9 miles northeast of the LNG terminal site. Figure 4.9.2-2 shows the locations of the nearest sensitive receptors to the project facilities. Detailed results of a Health Risk Assessment of the project's potential toxic air contaminant emissions on the SCAB and nearby sensitive receptors are presented in section 4.9.7.

Non-Internet Public

DRAFT ENVIRONMENTAL IMPACT STATEMENT/ENVIRONMENTAL IMPACT REPORT FOR THE LONG BEACH LNG IMPORT PROJECT

Docket No. CP04-58-000, et al.

Page 4-103
Figure 4.9.2-2

Public access for the above information is available only
through the Public Reference Room, or by e-mail at
public.referenceroom@ferc.gov

4.9.3 Applicable Air Quality Regulations

Federal, state, and local air quality regulations that apply to the Long Beach LNG Import Project are described below.

4.9.3.1 Federal Regulations

The EPA implements and enforces the requirements of many federal environmental laws. The federal CAA of 1970, amended in 1977 and most recently in 1990, provides the EPA with the legal authority to regulate air pollution from stationary and mobile sources. The federal regulations potentially applicable to equipment that would be used to construct and operate the proposed project are described below.

Mobile Source Regulations

Title II of the CAA Amendments of 1990 contains provisions relating to highway and off-road mobile sources. Regulations aimed at reducing pollution from heavy-duty diesel engines, including marine and locomotive engines, that have been promulgated or proposed include:

- Title 40 CFR Parts 69, 80, and 86, Final Rule, Control of Air Pollution from New Motor Vehicles: Heavy-Duty Engine and Vehicle Standards and Highway Diesel Fuel Sulfur Control Requirements – This rule requires a reduction in emissions from on-road diesel engines and establishes sulfur limits for diesel fuel. Currently, the requirements are for new engines only and the standards will begin to take effect in model year 2007. Although the emissions standards are for new engines only, the reduced sulfur diesel fuel, which is required to have a sulfur content less than 0.05 percent [500 parts per million by weight (ppmw)], a limit that is to be lowered to 15 ppmw starting in June 2006, would also reduce particulate and sulfur oxides (SO_x) emissions from existing diesel engines.
- Title 40 CFR Parts 9 and 69 et al., Final Rule, Control of Emissions of Air Pollution from Non-road Diesel Engines and Fuel – This rule requires emissions reductions from non-road diesel engines by establishing emissions limits and sulfur content limits. This rule targets agricultural equipment, construction equipment, and other non-road diesel engines. As with the previous rule, the reduced sulfur fuel would lower emissions from existing diesel engines even though the emissions limits would only apply to new engines.
- Title 40 CFR Parts 92 and 94, Proposed Rule, June 2004 – The EPA published an Advanced Notice of Proposed Rulemaking for New Locomotive and Marine Compression-Ignition Engines Less than 30 Liters per Cylinder, which requires emissions reductions from these types of engines. Engines less than 30 liters per cylinder and greater than 5 liters per cylinder are referred to as Category 2 engines. Category 2 engines are often used to propel tugboats, fishing vessels, and smaller cargo vessels. If promulgated, the emissions standards would begin to take effect in model year 2008, phasing in over a number of years.
- Title 40 CFR Parts 9 and 94, February 2003, Final Rule – This rule targets marine compression-ignition engines at or above 30 liters per cylinder. These engines are referred to as Category 3 marine engines. Category 3 engines are very large engines used for propulsion on deep sea vessels. New engines manufactured in 2004 must meet the emissions standards in this rule. There are no fuel standards in this rule and the

emissions standards are not as stringent as Category 1 and Category 2 engines. Category 3 engines often burn residual oils and bunker fuel with a very high sulfur content, making emissions reductions more difficult.

Title V Operating Permits Program

The Title V Operating Permits Program (CAA §501 et seq., 42 USC §7661; 40 CFR Part 70) requires issuance of operating permits that identify all applicable federal performance, operating, emissions monitoring, recordkeeping, and reporting requirements. The Title V requirements in the SCAB are implemented at the local level (i.e., through the SCAQMD) with federal oversight and, therefore, also require identification of applicable SCAQMD rules. New facilities in the SCAB are subject to Title V requirements if they have the potential to emit 10 tons per year (tpy) or more of NO_x, among other thresholds. The proposed LNG terminal would be subject to the Title V Operating Permits program because operating emissions of both NO_x and ROC would exceed the 10 tpy major source threshold. As a result, SES would be required to apply for and obtain a Title V operating permit and adhere to specific standards as well as monitoring/testing, recordkeeping, and reporting requirements specified within the permit.

Chemical Accident Prevention/Risk Management Plan

The chemical accident prevention provisions codified in Title 40 CFR Part 68 are federal regulations designed to prevent the release of hazardous materials in the event of an accident and minimize potential impacts if a release does occur. The regulations contain a list of substances and threshold quantities for determining applicability to stationary sources. If a stationary source stores, handles, or processes one or more substances on this list in a quantity equal to or greater than specified in the regulations, an RMP must be prepared and submitted for the facility. If a facility does not have a listed substance on site, or the quantity of a listed substance is below the applicability threshold, an RMP does not have to be prepared. In the latter case, the facility still must comply with the requirements of the general duty provisions in section 112(r)(1) of the 1990 CAA if there is any regulated substance or other extremely hazardous substance on site.

Stationary sources are defined in Title 40 CFR Part 68 as any buildings, structures, equipment, installations, or substance-emitting stationary activities that belong to the same industrial group, which are located on one or more contiguous properties, which are under the control of the same person (or persons under common control), and from which an accidental release may occur. However, the definition also states that the term “stationary source” does not apply to transportation, including storage incidental to transportation, of any regulated substance or any other extremely hazardous substance. The term “transportation” includes transportation subject to oversight or regulation under Title 49 CFR 192, 193, or 195 or a state natural gas or hazardous liquid program for which the state has in effect a certification to the DOT under Title 49 USC section 60105.

Two substances on the federal list of regulated substances, aqueous ammonia planned for use in the SCR of NO_x emissions from the water heaters and methane (the primary component of natural gas) in the LNG, would be stored in quantities potentially exceeding their listed threshold quantities of 20,000 and 10,000 pounds, respectively. However, based on the definitions of “stationary source” and “transportation,” an RMP would be required for the storage of aqueous ammonia and not for the methane contained in the LNG stored incidental to transportation. For the storage of methane, the facility would have to comply with the general duty provisions of the 1990 CAA as discussed above.

The RMP would include an off-site consequence analysis of the complete instantaneous failure of the largest storage container under regulatory-required meteorological conditions. A release from

multiple containers would be considered if the failure of one container had the potential to compromise other containers due to close proximity. The RMP would also include a prevention program that details safety precautions and maintenance and monitoring requirements as well as an emergency response program. The emergency response program identifies the procedures to be implemented to inform the public and response agencies should an accident occur.

Conformity of General Federal Actions

A conformity analysis must be conducted by the lead federal agency if a federal action would result in the generation of emissions that would exceed the conformity threshold levels (*de minimis*) of the pollutant(s) for which an air basin is in non-attainment. According to section 176(c)(1) of the CAA (Title 40 CFR section 51.853), a federal agency cannot approve or support any activity that does not conform to an approved SIP. Conforming activities or actions should not, through additional air pollutant emissions:

- cause or contribute to new violations of the NAAQS in any area;
- increase the frequency or severity of any existing violation of any NAAQS; or
- delay timely attainment of any NAAQS or interim emission reductions.

In the SCAB, the general conformity rule applies to projects with emissions that exceed 25 tpy of NO_x or ROC, 70 tpy of PM₁₀, or 100 tpy of CO or PM_{2.5}. A conformity analysis must show that the emissions would conform to the currently applicable SIP and would not reduce air quality in the air basin, which can be demonstrated through offsets, SIP provisions, or modeling.

4.9.3.2 State Regulations

The CARB implements and enforces the requirements of many federal environmental laws as well as its own parallel legislation that is often more stringent than federal laws. This legislation includes the air toxics and accidental release prevention provisions.

Air Toxic “Hot Spots” Information and Assessment Act (ATIAA) – The ATIAA was adopted in 1987 (California Health & Safety Code §44300 to 44384; 17 CCR §93300 to 93347) to supplement the Toxic Air Contaminant Identification and Control Act by requiring development of a statewide inventory of air toxics emissions from stationary sources. The AITAA is implemented at the local level with state oversight.

Facilities with toxic air emissions that are deemed to pose a significant health risk must issue notices to the exposed population. In 1992, the California legislature amended the AITAA to require facilities with toxic air emissions that are deemed to pose a significant health risk to implement RMPs.

California Accidental Release Prevention Program (CalARP) – The CalARP (California Health & Safety Code §22531 to 25543; 19 CCR §2735.1 to 2785.1) includes the requirements of the federal RMP with state additions. The Long Beach LNG Import Project would be subject to the CalARP because of its large storage capacity of aqueous ammonia for use in the SCR of NO_x emissions from the water heaters. The storage of natural gas incidental to transportation is not regulated under the CalARP; therefore, the LNG storage tanks would not be subject to this requirement.

The POLB has an RMP that is applicable to the proposed project. The RMP reinforces the requirements of the federal and California RMP regulations to analyze risks to the local population and other resources from the potential release of toxic, flammable, and explosive substances (see section 4.9.3.3).

Chapter 10 - Mobile Source Operational Controls, Article 1 - Motor Vehicles, Division 3. Air Resources Board, Title 13, California Code of Regulations – This regulation limits the amount of time a vehicle with a gross weight exceeding 10,000 pounds can idle when within 100 feet of a restricted area. Restricted areas include real property zoned for individual or multi-family housing. The purpose of this rule is to reduce public exposure to diesel particulate matter and other air contaminants.

4.9.3.3 Local Regulations

In the SCAB, the SCAQMD regulates stationary sources of air pollution through its administration of rules and regulations. The following SCAQMD rules and regulations are potentially applicable to the Long Beach LNG Import Project:

- Rule 201 - Permit to Construct – Stationary emission sources at the project site (such as the vaporization equipment and associated piping) cannot be constructed without first obtaining a permit from the SCAQMD.
- Rule 203 - Permit to Operate – Stationary emission sources at the project site (such as the vaporization equipment and associated piping) cannot be operated without first obtaining a permit from the SCAQMD.
- Rule 219 - Equipment Not Requiring a Written Permit Pursuant to Regulation II - Rule 219 lists equipment that is not subject to a permit. This rule often contains exemptions for miscellaneous small equipment (e.g., fork lifts and small combustion engines).
- Rule 403 - Fugitive Dust – This rule prohibits emissions of fugitive dust from any active operation, open storage pile, or disturbed surface area that remains visible beyond the emission source property line. A person conducting active operations shall utilize one or more of the applicable best available control measures to minimize fugitive dust emissions from each fugitive dust source type. During project construction, best available control measures identified in the rule would be required to minimize fugitive dust emissions from proposed earth-moving and grading activities.
- Rule 431.1 - Sulfur Content of Gaseous Fuels – This rule sets limits for the sulfur content of gaseous fuels (e.g., ethane fuel and natural gas) used and/or distributed. The project would be subject to this rule because the facility would revaporize the LNG for sale as natural gas.
- Rule 463 - Storage of Organic Liquids – Rule 463 sets requirements for tank roof seals, inspections, recordkeeping, and reporting. This rule applies to any aboveground stationary tank that stores organic liquids and has a capacity of more than 19,815 gallons. The proposed LNG storage tanks are larger than 19,815 gallons and would be subject to the requirements of this rule. This rule includes a self-inspection program that requires facility personnel to be trained and certified by the SCAQMD to perform and report the self inspections.
- Rule 466 - Pumps and Compressors – Rule 466 sets requirements for pump and compressor leakage limits, inspections, and recordkeeping. This rule would apply to the pumps and compressors at the proposed LNG terminal.

- Rule 466.1 - Valves and Flanges – Rule 466.1 sets requirements for valve and flange leakage limits, inspection, and recordkeeping. This rule would apply to the valves and flanges associated with the equipment at the proposed LNG terminal.
- Regulation XIII - New Source Review Requirements – Stationary sources of non-attainment criteria pollutants, or their precursors, can only be permitted by application of Lowest Achievable Emission Rate (LAER) control technology and elimination through offsets of at least an equal amount of the same pollutant or its precursors. Offsets are intended to ensure that no increase in net emissions occurs. In the SCAB, federal LAER control technology is labeled by the SCAQMD as Best Available Control Technology (BACT).
- Rule 1401 - New Source Review of Toxic Air Contaminants – A stationary source of toxic air contaminant emissions cannot receive a permit to operate unless an analysis shows that human health risk impacts are less than SCAQMD thresholds.
- Regulation XX - New Source Review for the Regional Clean Air Incentives Market (RECLAIM) – RECLAIM requires industries and businesses to cut their emissions by a specific amount each year. Businesses that exceed their reduction targets can trade their credits on the open market. RECLAIM applies to facilities with NO_x or SO_x emissions that exceed 4 tpy.
- Regulation XXX - Title V Permits – This regulation incorporates the requirements of the federal Title V operating permit program with state additions.

4.9.4 Construction Impacts and Mitigation

Construction of the Long Beach LNG Import Project would occur over a 48-month period and would consist of the following activities:

- site preparation and materials and equipment delivery;
- dredging to prepare the ship berth, reinforcement of the shoreline structures, and construction of the ship berth and unloading facility;
- excavation, ground stabilization, and foundation installation;
- construction of the LNG storage tanks, vaporization equipment, pumps, compressors, buildings, and other plant equipment;
- construction of a natural gas pipeline and a C₂ pipeline and associated aboveground facilities; and
- installation of electric distribution facilities.

Construction emissions would be caused by:

- construction equipment tailpipe emissions of criteria pollutants such as NO_x, ROC, PM₁₀, PM_{2.5}, SO_x, and CO;
- fugitive dust; and

- tailpipe emissions from worker commuter vehicles and material supply trucks.

A variety of construction equipment would be used at the project site, including dump trucks, pile drivers, bulldozers, graders, cranes, forklifts, generators, dredging equipment, and welding machines. Most of the equipment would be powered by diesel engines. Fugitive dust (PM₁₀) would be generated by earth-moving activities (such as grading or trenching), windblown dust on disturbed areas, and the movement of vehicles over paved and unpaved surfaces.

Worker commuter vehicles and material supply trucks, powered by gasoline and diesel engines, would arrive and depart from the LNG terminal periodically generating NO_x, ROC, PM₁₀, PM_{2.5}, SO_x, and CO.

Throughout the construction period, emissions would vary according to the intensity of each construction activity and the number of overlapping construction activities. Emissions would reach their peak about 2 years into the construction period, during simultaneous construction of the LNG storage tanks, physical plant, vaporizers, and ship berth and unloading facility. To compare to the SCAQMD significance thresholds, peak daily and peak quarterly criteria pollutant emissions were estimated for the sources of construction emissions (see tables 4.9.4-1 and 4.9.4-2, respectively). The estimated emissions in tables 4.9.4-1 and 4.9.4-2 take into account the implementation of several control measures as described below.

TABLE 4.9.4-1						
Peak Daily Construction Emission Rates Associated with the Long Beach LNG Import Project						
Emission Source/Thresholds	Emission Rate (pounds per day)					
	NO _x	ROC	PM ₁₀	PM _{2.5} ^a	SO _x	CO
Onsite Sources^b						
Welding Machines	110	12	10	10	8	129
Electric Generators	37	4	4	4	3	44
Onsite Materials Trucks	14	2	1	1	1	14
Construction Equipment (e.g., cranes, front-end loaders)	217	20	14	14	16	101
Construction Equipment (marine dredges)	21	2	1	1	2	21
Fugitive Dust ^c	0	0	476	476	0	0
Subtotal – Onsite Sources	399	40	506	506	30	309
Offsite Sources						
Materials Trucks (e.g., cement, rebar)	96	7	2	2	1	48
Workers (commuting)	49	49	3	3	0.3	459
Miscellaneous Deliveries (e.g., sanitation supplies)	3	0.3	0	0	0	3
Subtotal – Offsite Sources	148	56	5	5	1.3	510
Total Project Emissions	547	96	511	511	31	819
SCAQMD CEQA Significance Thresholds	100	75	150	150	150	550
Exceedance of Threshold	Yes	Yes	Yes	NA	No	Yes
^a To be conservative, PM _{2.5} emissions have been assumed to be equal to the estimated PM ₁₀ emissions. ^b Includes construction of the pipelines. ^c Fugitive dust emission estimates are based on the implementation of proposed control measures included in a comprehensive dust control program required by SCAQMD Rule 403. NA = Not applicable. There is no CEQA significance threshold for PM _{2.5} .						

TABLE 4.9.4-2						
Peak Quarterly Construction Emission Rates Associated with the Long Beach LNG Import Project						
Emission Source/Thresholds	Emission Rate (tons per quarter)					
	NO _x	ROC	PM ₁₀	PM _{2.5} ^a	SO _x	CO
Onsite Sources^b						
Welding Machines	3.6	0.4	0.4	0.4	0.3	4.3
Electric Generators	1.2	0.1	0.1	0.1	0.1	1.4
Onsite Materials Trucks	0.5	0.1	0.0	0.0	0.0	0.5
Construction Equipment (e.g., cranes, front-end loaders)	7.2	0.6	0.5	0.5	0.5	3.3
Construction Equipment (marine dredges)	0.6	0.1	0.0	0.0	0.0	0.5
Fugitive Dust ^c	0.0	0.0	15.7	15.7	0.0	0.0
Subtotal - Onsite Sources	13.1	1.3	16.7	16.7	0.9	10.0
Offsite Sources						
Materials Trucks (e.g., cement, rebar)	3.2	0.2	0.1	0.1	0.0	1.6
Workers (commuting)	1.6	1.6	0.1	0.1	0.0	15.2
Miscellaneous Deliveries (e.g., sanitation supplies)	0.1	0.0	0.0	0.0	0.0	0.1
Subtotal - Offsite Sources	4.9	1.8	0.2	0.2	0.0	16.9
Total Project Emissions	18.0	3.1	16.9	16.9	0.9	26.9
SCAQMD CEQA Significance Thresholds	2.5	2.5	6.75	6.75	6.75	24.75
Exceedance of Threshold	Yes	Yes	Yes	NA	No	Yes
^a To be conservative, PM _{2.5} emissions have been assumed to be equal to the estimated PM ₁₀ emissions. ^b Includes construction of the pipelines. ^c Fugitive dust emission estimates are based on the implementation of proposed control measures included in a comprehensive dust control program required by SCAQMD Rule 403. NA = Not applicable. There is no CEQA significance threshold for PM _{2.5} .						

SCAQMD Rule 403 requires the implementation of BMPs throughout the construction period to minimize the generation of fugitive dust. The comprehensive dust control program proposed for the Long Beach LNG Import Project includes the following measures:

- construction equipment and vehicles would operate at the lowest practical speed (e.g., less than 15 mph);
- vehicle movement on the site would be on paved areas as much as possible;
- unpaved areas where construction equipment is operating would be watered frequently enough to prevent a visible plume from soil entrainment;
- exits from the construction work area would have a transition ramp with wheel washers, bumps, or other methods to minimize track-out of soil from the site; and
- soil piles and other open soil areas not being actively used would be treated with dust control measures or have their moisture levels controlled to eliminate wind-induced dust emissions.

The fugitive dust emissions reported in tables 4.9.4-1 and 4.9.4-2 take this dust control program into account. No additional control measures are available for fugitive dust emissions.

To reduce project construction emissions from onsite diesel-fueled combustion equipment, SES' contract specifications would require that all off-road diesel-fueled equipment powered by compression ignition engines meet or exceed the Tier III NO_x, VOC, and CO emission standards and Tier II particulate

matter emission standards for units rated 37 to 560 kilowatts (kW) (49.6 horsepower (hp) to 751 hp), and Tier II NO_x, VOC, CO, and particulate matter emission standards for units rated less than 37 kW and greater than 560 kW in accordance with table 1 of Title 40 CFR Part 89.112. For all other equipment, contract specifications would require that the newest equipment in the construction contractors' fleets be used to take advantage of the general reduction in emission factors that occurs with each model year.

In addition, the following control measures would be implemented in accordance with the POLB's air quality requirements and construction standards:

- dredging contractors would be required to use electric-powered dredges for all hydraulic dredges and ultra-low sulfur or emulsified diesel in all other types of dredges;
- concurrent use of equipment would be minimized by construction phasing or other approved method;
- equipment would be turned off when not in use;
- construction activities would be suspended during Stage II smog alerts;
- bare ground surfaces would be watered before grading activities begin and at least twice each day thereafter;
- no soil excavation or hauling would occur when wind speeds exceed 25 mph;
- disturbed surface areas not under active construction would be treated with a soil stabilizer to minimize erosion; and
- vehicular activity on unpaved surfaces would be restricted and vehicles would not exceed 15 mph on those surfaces.

Additional offsite construction emissions would be generated from workers commuting to the project site and equipment/material shipments to the site or to the temporary laydown and worker parking area by road, rail, or barge. The construction workforce would be relatively small (peak of about 404 workers) and would primarily consist of workers from within the Los Angeles and Orange County labor pool. The workers would commute to the temporary laydown and worker parking area on Ocean Boulevard and would then be transported to the site via buses.

As shown in tables 4.9.4-1 and 4.9.4-2, total project construction emissions would exceed the SCAQMD significance thresholds for all criteria pollutants except SO_x on a peak daily and quarterly basis even after the implementation of control measures. Therefore, construction of the project would have a temporary but significant impact on ambient criteria pollutant levels in the SCAB. However, SES' control measures do not include the POLB standard mitigation measure that requires all contractors to use ultra-low sulfur or CARB-approved alternative diesel fuel in all diesel-powered equipment used onsite. SES has also not committed to using alternative-fuel buses to transport workers to and from the temporary laydown and worker parking area. Therefore, **the Agency Staffs will recommend to their respective Commissions that the following measure be included as a specific condition of any approvals issued by the FERC and the POLB:**

- **SES shall:**
 - a. **require all contractors to use ultra-low sulfur or CARB-approved alternative diesel fuel in all diesel-powered equipment used onsite during construction; and**

b. use alternative-fuel buses to transport workers to and from the temporary laydown and worker parking area.

Although implementation of the Agency Staffs' recommended mitigation measure would reduce emissions during the construction phase of the project, impacts on air quality during construction are still expected to remain significant.

During project construction, some individuals may detect odorous emissions from diesel-powered construction equipment. Temporary exposure to the atmosphere of the dredged materials could also produce odorous emissions from the decomposition of organic matter. However, due to the temporary nature of these emissions, the relatively large distance to the nearest sensitive receptors, and the expectation that odors would be well dispersed outside of the immediate construction work area, the odor emissions during construction are not expected to create a public nuisance.

4.9.5 Operational Impacts and Mitigation

Operational emission sources would include marine vessels, vaporization equipment, fugitive process emissions, on-road vehicles, emergency generator and firewater pumps, and, ultimately, LNG consumers. There would be no emissions generated by the export C₂ heater because it would be operated via heat transfer. Emissions from LNG consumers are discussed in section 4.9.8. The remaining sources and the assumptions used to calculate the operational emissions from each source are described below.

Marine Vessels

Marine vessels used during project operation would include LNG ships, tugboats, pilot boats, and Coast Guard escort boats. The annual emission inventory accounts for 120 LNG ship arrivals, which is equivalent to 1 arrival every 3 days. Two tugboats, one pilot boat, and one Coast Guard escort boat would participate in the arrival, berthing, and departure of each LNG ship. Emissions were calculated for each ancillary vessel over the distance it would travel to meet the LNG ship. Emissions from the LNG ship were calculated for the 27 nm required by the SCAQMD (2003b). The one-way distance traveled by the other vessels would be 5.6 nm for the pilot boat and first tugboat, 2.6 nm for the second tugboat, and 6 nm for the Coast Guard escort boat.

The unloading of each LNG ship at berth (vessel activities during that period are referred to as hotelling) would typically require 6 to 12 hours; however, to be conservative an 18-hour hotelling duration was assumed. During unloading, emissions would be generated from the ship's main boilers as they produce steam to provide auxiliary power to pump LNG and to run the ship's lights and other utilities.

SES proposes that during hotelling, the LNG ships would use boil-off LNG to the maximum extent consistent with safe, reliable operation to heat their boilers and produce steam for propulsion and auxiliary power; the remainder of the fuel would be residual fuel oil No. 6. The tugboats, pilot boats, and Coast Guard escort boats were assumed to use diesel fuel for the purpose of this analysis. Except for the Coast Guard escort boats, the diesel engines used in the tugs and pilot boats would be re-powered to EPA Tier 2 Standards through California's Carl Moyer Program.

Vaporization Equipment

Three direct-fired water heaters associated with the vaporization equipment would generate hot water to be used as a heat transfer medium for the LNG shell and tube vaporizers and NGL extraction system reboilers. Each heater would be rated at approximately 380 MMBtu per hour based on the fuel low heating value. Two of the heaters would operate at any one time, with the third heater on hot "pilot"

standby. The heaters would use fuel gas generated onsite as their fuel. The priority of the fuel gas system is the use of C₃₊ first, boil-off gas second, and vaporized LNG last.

Recently, new vaporization processes have been developed that primarily utilize air exchangers as a heat source and may reduce air emissions associated with these processes. This vaporization technology was analyzed as an alternative to SES' proposed vaporization process (see section 3.6). While air exchange systems have been successfully demonstrated and operated at other facilities (e.g., Dahej LNG terminal in India), the space requirements of air exchangers and back-up heaters/vaporizers appear to make this approach technically infeasible at the site proposed for the Long Beach LNG Import Project.

Fugitive Process Emissions

Natural gas (primarily methane, a greenhouse gas) and the ROC contained therein would be released in small quantities as fugitive emissions from various onsite source locations, including the LNG storage tanks and NGL recovery system. The emission rates from these fugitive sources were estimated based upon proposed equipment counts. To minimize fugitive emissions, the LNG storage tanks and associated facilities would be equipped with a vapor handling system as described in section 2.1.1.4. The vehicle fuel truck loading rack would also contain equipment and tankage to capture LNG vapor.

On-Road Vehicles

During project operation, multiple types of highway vehicles would travel to and from the project facilities to load and deliver LNG to vehicle refueling sites within the SCAB, and materials, employees, and visitors to the LNG terminal.

The LNG trailer trucks were originally assumed to be diesel-fueled even though LNG-fueled trailer trucks may become available by 2008. The activities associated with the proposed project would include loading LNG into trailer trucks owned by other companies; therefore, SES originally estimated emissions assuming it would not be able to control the type of fuel used in the truck engine. This is also the reason that the use of diesel exhaust catalytic particulate filters cannot be guaranteed by SES.

After further evaluation, SES determined that the use of LNG-fueled LNG trailer trucks would be feasible. Because SES would voluntarily implement this control measure through the contracting process, estimated emissions for LNG trailer trucks were reduced. Due to the relatively low number of daily truck and automobile trips generated by the project, the project would not cause any significant degradation to LOS in the Port area (see section 4.7.2). Therefore, project-induced local CO and PM₁₀ "hot spots" at intersections affected by the project are not anticipated.

Emergency Generator and Firewater Pumps

The emergency electric generator and firewater pumps would be powered by internal combustion engines burning alternative fuels such as liquefied C₃₊, liquefied C₂, or other clean diesel fuel. The engines would be used only when electric power is not available from the grid, for firefighting, and 0.5 hour each week for testing.

Operational Emissions

Peak daily emissions were estimated for each of the operational sources described above, and are presented in table 4.9.5-1 along with the SCAQMD significance thresholds. Annual emissions are presented in table 4.9.5-2.

Emissions were not estimated for LNG consumers in tables 4.9.5-1 and 4.9.5-2 because the project-induced replacement of gasoline- or diesel-powered vehicles with LNG-powered vehicles cannot

be accurately predicted at this time. However, the potential emissions benefits associated with the use of LNG-powered vehicles compared to their gasoline and diesel counterparts are discussed in section 4.9.8.

TABLE 4.9.5-1						
Peak Daily Operational Emission Rates Associated with the Long Beach LNG Import Project						
Emission Source	Emission Rate (pounds per day)					
	NO _x	ROC	PM ₁₀	PM _{2.5} ^a	SO _x	CO
Marine Based Operations						
LNG Ships ^b (CEQA boundary to precautionary zone)	136	2.1	32	32	432	39
LNG Ships ^b (within precautionary zone)	52	0.8	12	12	161	15
LNG Ships ^b (precautionary zone to berth)	117	1.5	32	32	445	30
LNG Ships - Hotelling ^c	379	7.6	64	64	808	129
Tugboats	74	8.3	2.6	2.6	0.1	45
Pilot Boats and Coast Guard Escort Boats	11	1.2	0.4	0.4	< 0.01	6.7
Subtotal - Marine Based Operations	769	22	143	143	1,846	265
Facility Based Operations						
Vaporization Equipment						
Water Heaters ^d	80.3	108.2	36.1	36.1	1.2	74.2
Fugitive Process Emissions						
Equipment Leaks (valves, flanges)	0	0.3	0	0	0	0
On-Road Vehicles						
LNG Trailer Trucks	5.2	4.4	0.3	0.3	0	2.1
Delivery Trucks	0.3	0.1	0.01	0.01	< 0.01	1.4
Employee and Visitor Light Duty Trucks	3.8	1.3	0.1	0.1	0.04	36.3
Emergency Equipment						
Emergency Generator	3.7	0.2	0.2	0.2	< 0.01	1.6
Firewater Pumps	3.8	0.3	0.1	0.1	0.6	0.9
Subtotal – Facility Based Operations	97	115	37	37	1.8	117
Total Project Emissions	866	137	180	180	1,848	382
SCAQMD CEQA Significance Thresholds	55	55	150	150	150	550
Exceedance of Threshold	Yes	Yes	Yes	NA	Yes	No
^a To be conservative, PM _{2.5} emissions have been assumed to be equal to the estimated PM ₁₀ emissions. ^b Assumes steamship boiler uses both LNG boil-off gas and residual fuel No. 6 while underway. Emissions are within SCAQMD waters only. Maximum daily transport emissions are based on one ship arriving and departing in a single day. ^c Assumes steamship boiler primarily uses LNG boil-off gas plus a minor quantity of residual fuel No. 6 during hotelling. ^d The water heater emissions include BACT. NA = Not applicable. There is no CEQA significance threshold for PM _{2.5} .						

As shown in table 4.9.5-1, on a peak daily basis, marine vessels would be the largest contributors to the project's overall emissions of NO_x, PM₁₀, PM_{2.5}, SO_x, and CO. The vaporization equipment would be the largest contributor to the project's overall emissions of ROC. Total project emissions, adjusted to account for SCAQMD-required emission offsets and after implementation of proposed control measures, would exceed the daily SCAQMD significance thresholds for NO_x, ROC, PM₁₀, and SO_x. The daily emissions for CO would be less than significant.

As shown in table 4.9.5-2, on an annual basis, marine vessels would be the largest contributor to the project's overall emissions of NO_x, PM₁₀, PM_{2.5}, SO_x, and CO. The vaporization equipment would be the largest contributor to the project's overall emissions of ROC.

TABLE 4.9.5-2						
Peak Annual Operational Emission Rates Associated with the Long Beach LNG Import Project						
Emission Source	Emission Rate (tons per year)					
	NO _x	ROC	PM ₁₀	PM _{2.5} ^a	SO _x	CO
Marine Based Operations						
LNG Ships ^b (CEQA boundary to precautionary zone)	8.2	0.1	1.9	1.9	25.9	2.4
LNG Ships ^b (within precautionary zone)	3.1	0.1	0.7	0.7	9.6	0.9
LNG Ships ^b (precautionary zone to berth)	7.0	0.1	1.9	1.9	26.7	1.8
LNG Ships - Hotelling ^c	22.8	0.5	3.8	3.8	48.5	7.7
Tugboats	4.0	0.5	0.2	0.2	< 0.01	2.7
Pilot Boats and Coast Guard Escort Boats	0.7	0.1	0.02	0.02	< 0.001	0.4
Subtotal – Marine Based Operations	46	1.4	8.5	8.5	111	16
Facility Based Operations						
Vaporization Equipment						
Water Heaters ^d	14.7	19.7	6.6	6.6	0.2	13.6
Fugitive Emissions						
Equipment Leaks (Valves, Flanges)	0	0.05	0	0	0	0
On-Road Vehicles						
LNG Trailer Trucks	0.9	0.8	0.1	0.1	0	0.4
Delivery Trucks	0.04	< 0.01	< 0.001	< 0.001	< 0.001	0.2
Employee and Visitor Light Duty Trucks	0.7	0.2	0.02	0.02	0.01	6.6
Emergency Equipment						
Emergency Generator	0.1	< 0.01	< 0.01	< 0.01	< 0.001	0.04
Firewater Pumps	0.1	< 0.01	< 0.01	< 0.01	0.02	0.02
Subtotal – Facility Based Operations	17	21	6.7	6.7	0.2	21
Total Project Emissions	63	22	15	15	111	37
^a To be conservative, PM _{2.5} emissions have been assumed to be equal to the estimated PM ₁₀ emissions. ^b Assumes steamship boiler uses both LNG boil-off gas and residual fuel No. 6 while underway. Emissions are within SCAQMD waters only. Emissions assume 120 ship calls per year. ^c Assumes steamship boiler primarily uses LNG boil-off gas plus a minor quantity of residual fuel No. 6 during hotelling. Emissions assume 120 ship calls per year. ^d The water heater emissions include BACT.						

Criteria pollutant emissions identified in tables 4.9.5-1 and 4.9.5-2 associated with operation of the Long Beach LNG Import Project are based on reductions resulting from the implementation of the following control measures:

- LAER/BACT would be applied by SES to the stationary sources as follows:
 - a. SCR technology to reduce NO_x emissions from the water heaters;
 - b. oxidation catalyst, or equivalent reduction of CO and ROC emissions from the water heaters; and
 - c. metal oxide absorption of sulfur compounds in C₂ removed from LNG; and

- fugitive ROC emissions from various points in the terminal would be minimized by design elements and through the implementation of a comprehensive leak detection and repair program.

Additionally, the AQMP includes control measures that are intended to be implemented by federal and state governments to reduce emissions from ships and on-road trucks. The proposed project would comply with all applicable requirements of the AQMP.

To further reduce the proposed project emissions, SES would implement the POLB air quality requirements and operational standards described below.

- All diesel-powered, non-road mobile terminal equipment would meet the emissions standards set forth in the EPA's Control of Emissions of Air Pollution From Non-Road Diesel Engines and Fuel. Future purchases of such equipment must also meet or exceed those standards.
- Where such use meets all vessel safety requirements in accordance with the SOLAS treaty or other international, federal, or state requirements, ships calling at the terminal that do not use LNG boil-off gas in the main engines for hotelling power would use fuels such as the CARB's #2 diesel, gas-to-liquid diesel, biofuels, or a marine distillate fuel (as specified by ISO 8217), in the ship's auxiliary power generator motors, or would use exhaust treatment technology. A report would be submitted quarterly to the POLB Director of Planning indicating which ships complied with this requirement and which ships did not, and for those that did not comply, the report would include the reason(s) for noncompliance.

In addition to the POLB air quality requirements and operational standards, SES would be required to implement the following control measures:

- LNG ships would generate power from combustion of boil-off LNG rather than from fuel oil if they are equipped to do so;
- LNG trailer trucks would be LNG-fueled and the LNG trailer truck engines would be turned off during onsite loading; and
- operational personnel would be encouraged to rideshare and use mass transit.

Implementation of the control measures listed above would reduce operational emissions; however, given the magnitude of the emissions, operational emissions after implementation of the control measures are expected to remain significant.

Dispersion Modeling Analysis

SCAQMD Rule 1303 requires dispersion modeling of NO_x, CO, PM₁₀, PM_{2.5}, and SO₂ emissions from the water heater stacks associated with the vaporization equipment to determine whether they would cause a local violation, or significantly contribute to an existing violation, of the ambient air quality standards. In accordance with the requirements, a dispersion modeling analysis was performed. The modeled concentrations at or beyond the LNG terminal property line were added to background monitored concentrations to predict total ambient concentrations. Table 4.9.5-3 presents the results of the analysis, and compares the predicted concentrations to the applicable NAAQS and CAAQS.

Pollutant	Averaging Period	Background Concentration (µg/m ³) ^b	Maximum Facility Concentration (µg/m ³)	Total Concentration (µg/m ³)	NAAQS (µg/m ³)	CAAQS (µg/m ³)	Below Standard
NO ₂	1-hour	282	1.6	283.6	--	470	Yes
	Annual Arithmetic Mean	64.2	0.2	64.4	100	--	Yes
CO	1-hour	11,500	2.1	11,502	40,000	23,000	Yes
	8-hour	6,444	1.2	6,445	10,000	10,000	Yes
PM ₁₀	24-hour	105	0.2	105.2	150	50	No ^c
	Annual Arithmetic Mean	38.9	0.06	39	50	20	No ^d
PM _{2.5}	24-hour	82	0.2	82.2	65	--	No ^e
	Annual Arithmetic Mean	21.5	0.06	21.6	15	12	No ^f
SO ₂	1-hour	131	0.09	131.1	--	655	Yes
	3-hour ^g	118	0.07	118.1	1,300	--	Yes
	24-hour	36.8	0.02	36.8	365	105	Yes
	Annual Arithmetic Mean	8.0	0.007	8.0	80	--	Yes
^a Predicted maximum facility concentrations are based on impacts resulting from the water heater stacks associated with the vaporization equipment. ^b Maximum concentrations taken from 1999-2002 Long Beach ambient monitoring data. ^c The background concentration exceeds the CAAQS; however, the facility contribution of 0.2 µg/m ³ (24-hour average) does not exceed 2.5 µg/m ³ , which is the allowable significant change according to table A-2 in Appendix A of SCAQMD Rule 1303. ^d The background concentration exceeds the CAAQS; however, the facility contribution of 0.06 µg/m ³ (annual arithmetic mean) does not exceed 1.0 µg/m ³ , which is the allowable significant change according to table A-2 in Appendix A of SCAQMD Rule 1303. ^e The background concentration exceeds the NAAQS; however, the facility contribution would be less than 1 percent of the 24-hour standard. ^f The background concentration exceeds the CAAQS/NAAQS; however, the facility contribution would be less than 1 percent of the annual CAAQS/NAAQS. ^g The 3-hour concentrations listed above are proportioned from 1-hour concentrations by a factor of 0.9, in accordance with guidance from the Office of Environmental Health Hazard Assessment, California Air Resources Board, and Environmental Protection Agency. Note: The modeled sources include the water heaters with BACT.							

The maximum predicted concentrations occur near the property line, just north of the LNG terminal site. The modeled impacts from the heater stacks at the nearest sensitive receptors are much less than these maximum values, and less than significant for all modeled pollutants.

SES also conducted a dispersion modeling analysis of NO_x, CO, PM₁₀, PM_{2.5}, and SO₂ emissions from the project as a whole. This included the emissions from the water heater stacks, marine vessels associated with the terminal operations within the SCAQMD's boundary, and idling LNG trailer trucks. Table 4.9.5-4 presents the results of this analysis, and compares the concentrations to the NAAQS and CAAQS.

TABLE 4.9.5-4							
Maximum Offsite Criteria Pollutant Concentrations Associated with the Long Beach LNG Import Terminal Project ^a							
Pollutant	Averaging Period	Background Concentration (µg/m ³) ^b	Maximum Project Concentration (µg/m ³)	Total Concentration (µg/m ³)	NAAQS (µg/m ³)	CAAQS (µg/m ³)	Below Standard
NO ₂	1-hour	282	166.2	448	--	470	Yes
	Annual Arithmetic Mean	64.2	2.4	67	100	--	Yes
CO	1-hour	11,500	99.2	11,599	40,000	23,000	Yes
	8-hour	6,444	15.9	6,460	10,000	10,000	Yes
PM ₁₀	24-hour	105	5.2	110.2	150	50	Yes/No ^c
	Annual Arithmetic Mean	38.9	0.4	39.3	50	20	Yes/No ^c
PM _{2.5}	24-hour	82	5.2	87.2	65	--	No ^d
	Annual Arithmetic Mean	21.5	0.4	21.9	15	12	No ^e
SO ₂	1-hour	131	196	327	--	655	Yes
	3-hour ^f	118	127	245	1,300	--	Yes
	24-hour	36.8	65.8	103	365	105	Yes
	Annual Arithmetic Mean	8.0	5.2	13.2	80	--	Yes
^a Predicted maximum project concentrations are based on impacts resulting from the water heater stacks associated with the vaporization equipment, marine vessels associated with the terminal operating within the SCAQMD's boundary, and idling LNG trailer trucks.							
^b Maximum concentrations taken from 1999-2002 Long Beach ambient monitoring data.							
^c Although the total concentration is below the NAAQS, it is predicted to exceed the CAAQS; however, the project contribution would be approximately 10 percent of the 24-hour CAAQS.							
^d The background concentration exceeds the NAAQS; however, the project contribution would be less than approximately 8 percent of the 24-hour standard.							
^e The background concentration exceeds the CAAQS/NAAQS; however, the project contribution would be less than 3 percent of the annual NAAQS and less than 4 percent of the annual CAAQS.							
^f The 3-hour concentrations listed above are proportioned from 1-hour concentrations by a factor of 0.9, in accordance with guidance from the Office of Environmental Health Hazard Assessment, California Air Resources Board, and Environmental Protection Agency.							
Note: The modeled sources include the water heaters with BACT.							

Summary of Operational Impacts and Mitigation

As shown in table 4.9.5-1, the project's operational emissions would exceed the daily SCAQMD CEQA significance thresholds for NO_x, ROC, PM₁₀, and SO_x. Additionally, although dispersion modeling results for the facility vaporization equipment and the project as a whole indicate that the operation of the facility would have a minimal impact on the existing air quality in the vicinity of the proposed project area (see tables 4.9.5-3 and 4.9.5-4), the predicted impacts from operational emissions would potentially worsen an existing violation of the ambient air quality standards for PM₁₀ and PM_{2.5} even after implementation of all of SES' proposed control measures. Consequently, the project's impact would be considered significant for ozone (NO_x and ROC), PM₁₀, PM_{2.5} and SO_x. The project's impact would not be considered significant for CO. Given the nature of the project operations, especially vessel operations, the Agency Staffs have determined that there are no additional feasible measures that would further reduce air emissions.

The replacement of diesel fuel with LNG in on-road vehicles that may occur from implementation of the proposed project could result in reductions in NO_x, PM₁₀, PM_{2.5}, SO_x, and CO emissions within the SCAB. Conversely, ROC emissions may increase. The increase in ROC emissions would be negated by an even greater decrease in emissions of NO_x, the other ozone precursor. These reductions could be large enough to offset the emission increases associated with the project, thereby

resulting in a net air quality benefit to the SCAB. However, an accurate estimate of the amount of diesel replacement that could be directly attributed to the proposed project is not available at this time. Section 4.9.8 describes the potential LNG consumers in greater detail.

Combustion of natural gas and diesel fuel during project operations would not generate a perceptible odor onsite or offsite. The potential for offsite odors due to the use of methyl mercaptan, an odorant to alert people to the presence of leaking natural gas, would be minimized because the odorizing equipment would be tightly sealed in a specially designed dispensing facility.

4.9.6 General Conformity Determination

As previously discussed, a conformity analysis must be conducted by the lead federal agency if a federal action would result in the generation of emissions that would exceed the conformity threshold levels (*de minimis*) of the pollutant(s) for which an air basin is in non-attainment. A conformity analysis must show that the emissions would conform to the SIP and would not reduce air quality in the air basin, which can be demonstrated through offsets, SIP provisions, or modeling. The SCAB is designated as a “severe” non-attainment area for the 8-hour ozone standard, a “serious” non-attainment area for both CO and PM₁₀, and a non-attainment area for PM_{2.5}. As a result, the FERC conducted a conformity analysis for the Long Beach LNG Import Project to determine if the emissions associated with the project would conform to the SIP and would not reduce air quality in the SCAB. The results of the FERC’s analysis are contained in the Draft General Conformity Determination included in Appendix E.

As discussed in Appendix E, documentation supporting conformity has not been filed with the FERC. Until this information is provided by SES, the Long Beach LNG Import Project is deemed to not conform with the applicable SIP and AQMP. SES must complete a full air quality analysis and identify any mitigation requirements necessary for a finding of conformity before a determination of conformity can be made. Upon receipt of the required information from SES, the FERC staff will complete the analysis and issue a Final General Conformity Determination for the Long Beach LNG Import Project.

To allow the FERC staff to complete its analysis and issue a Final General Conformity Determination, the FERC staff **recommends that:**

- **SES shall complete a full air quality analysis and identify any mitigation requirements necessary for a finding of conformity with the applicable SIP and AQMP. SES shall file documentation supporting conformity with the Secretary of the Commission (Secretary) before the end of the draft EIS/EIR comment period for review and analysis in the final EIS/EIR.**

4.9.7 Health Risk Assessment

In accordance with SCAQMD Rule 1401, a Health Risk Assessment of the project’s potential toxic air contaminant emissions on humans was conducted. The analysis included the inhalation exposure pathway, as well as dermal absorption; soil ingestion; water ingestion; and food ingestion via plants, animal products, and mother's milk.

The sources considered in the analysis included the water heaters associated with the vaporization equipment, hotelling emissions from the LNG ships, movement of the LNG ships within the SCAQMD’s boundary, tugboats, pilot boats, Coast Guard escort boats, and idling emissions from the LNG trailer trucks that would load at the terminal. Table 4.9.7-1 presents the potential emissions of toxic air contaminants associated with combustion of natural gas or diesel fuel from these sources. Table 4.9.7-2 presents the maximum individual lifetime cancer risk and the noncarcinogenic health hazard indices for the nearest residence and for nearby workers. The excess cancer burden is also presented.

TABLE 4.9.7-1

Maximum Emission Rates of Toxic Air Contaminants

Pollutant	Emission Rate ^a	
	Hourly (pounds per hour) ^b	Annual (pounds per year) ^b
Acetaldehyde	7.4E-04	6.5
Acrolein	6.6E-04	5.8
Ammonia	2.2 ^c	19,000
Arsenic	2.6E-04	2.3
Benzene	1.5E-03	13
Beryllium	1.2E-05	0.11
1,3-Butadiene	1.6E-04	1.4
Cadmium	9.6E-04	8.4
Chromium (hexavalent)	1.2E-03	10
Copper	8.4E-04	7.4
Dichlorobenzene	3.5E-05	0.31
Diesel exhaust particulate	3.9E-02	340
7,12-Dimethylbenz(a)anthracene	5.6E-07	4.9E-03
Ethylbenzene	1.7E-03	14
Formaldehyde	9.8E-03	86
Hexane	5.4E-02	470
Lead	5.2E-04	4.5
Manganese	5.3E-04	4.7
Mercury	2.3E-04	2.0
3-Methylcholanthrene	5.3E-08	4.6E-04
Naphthalene	3.4E-04	3.0
Nickel	7.7E-03	68
POM/PAHs ^c	3.3E-04	2.9
Benz(a)anthracene	1.8E-06	1.6E-02
Benzo(a)pyrene	1.0E-06	8.9E-03
Benzo(b)fluoranthene	1.5E-06	1.3E-02
Benzo(k)fluoranthene	1.6E-06	1.4E-02
Chrysene	1.7E-06	1.5E-02
Dibenz(a,h)anthracene	1.1E-06	1.0E-02
Indeno(1,2,3-c,d)pyrene	1.7E-06	1.5E-02
Propylene	1.9E-01	1,700
Selenium	6.8E-05	0.60
Toluene	3.3E-03	29
Vanadium	2.3E-03	20
Xylenes (mixed)	1.2E-02	100
Zinc	2.7E-02	230

^a Very small values are presented concisely in scientific notation (e.g., the hourly rate of 1.5E-03 for benzene is equivalent to 1.5×10^{-3} or 0.0015).

^b Water heater emission rates based upon emission factors from the EPA (1998) and communication from the SCAQMD (2003c).

^c POM = polycyclic organic matter. PAHs = polycyclic aromatic hydrocarbons, expressed as equivalent benzo(α)pyrene, includes 7,12-dimethylbenz(a)anthracene, acenaphthene, acenaphthylene, and anthracene.

Note: Emissions are reported for the water heaters with BACT, hotelling LNG ships, movement of the LNG ships within the SCAQMD's boundary, tugboats, pilot boats, and Coast Guard escort boats, and idling emissions from the LNG trailer trucks that would load at the terminal. The tugboats, pilot boats, and Coast Guard escort boats are responsible for the diesel exhaust particulate emissions.

TABLE 4.9.7-2				
Maximum Potential Health Risks Associated with the Long Beach LNG Import Project				
Exposure Conditions	Carcinogenic Risk		Noncarcinogenic Risks	
	Probability	Excess Cancer Burden	Chronic Hazard Index	Acute Hazard Index
Long-Term (70-year) Exposure (Residential) ^a	1.5 in 1 million	0.003	0.002	0.002
Long-Term (46-year) Exposure (Worker) ^b	2.5 in 1 million		0.003 ^c	0.013 ^d
Significance Threshold	10 in 1 million	0.5	1.0	1.0
Significance Level	Insignificant	Insignificant	Insignificant	Insignificant
^a Based on 24 hours per day, 365 days per year exposure at the nearest residence (Receptor No. 1751) for 70 years. ^b Highest offsite occupational risk occurs at Receptor No. 515 just northwest of the LNG terminal site along the edge of Pier T. Worker exposure is based on 8 hours per day, 240 days per year for 46 years. ^c Maximum non-carcinogenic chronic health hazard index occurs at Receptor No. 443 located east of the LNG terminal property boundary. ^d Maximum non-carcinogenic acute health hazard index occurs at Receptor No. 514 located just northwest of the LNG terminal along the edge of Pier T. Note: The Health Risk Assessment includes the water heaters with BACT, hotelling LNG ships, and idling emissions from the LNG trailer trucks that load at the terminal.				

The cancer risk of 1.5 in 1 million for the nearest residence is based on an assumed continuous (24 hours per day) exposure over a 70-year lifetime. The risk of 2.5 in 1 million for a worker is based on an exposure of 8 hours per day for 46 years, in accordance with the guidance in SCAQMD Risk Assessment Procedures for Rules 1401 and 212, Version 6.0, August 18, 2000. The cancer risk at each receptor, including sensitive receptors, is less than the 10-in-1-million significance threshold established in SCAQMD Rule 1401.

Cancer burden was also calculated based on the maximum predicted cancer risk and the estimated number of persons exposed. The cancer burden is predicted to be 0.003, which is less than the significance threshold of 0.5 established in SCAQMD Rule 1401. Likewise, the maximum chronic and acute health hazard indices are predicted to be well below the significance threshold of 1.0. Therefore, the impact of the Long Beach LNG Import Project on human health risks would be less than significant.

Although the proposed project would not exceed cancer risk level significance thresholds established by the SCAQMD for toxic air pollutant health impacts, the SCAB and Port areas in particular are assumed, on the basis of the SCAQMD's MATES II Study, to suffer significant impacts related to toxic air pollutants and associated cancer risk levels. Therefore, toxic air pollutants resulting from the project would likely contribute to an existing cumulatively significant air quality impact in the SCAB (see section 4.12).

4.9.8 LNG Consumers

Consumers of the natural gas associated with the proposed project would include:

- residential, commercial, and industrial customers in the SCAB that would consume the vaporized natural gas sent from the LNG terminal to the SoCal Gas pipeline;
- the ConocoPhillips LARC would consume C₂ recovered from the LNG sent via pipeline from the LNG terminal directly to the facility; and

- LNG-powered vehicles that would purchase LNG delivered to regional vehicle refueling stations from the proposed LNG terminal.

The vaporized natural gas sent to the SoCal Gas pipeline would need to meet the SoCal Gas tariff requirements and the CPUC gas purity requirements. These requirements include limits on Btu and sulfur content. To maintain the required Btu content, the NGL recovery unit would remove a portion of the higher Btu components. The project's natural gas would have to meet the same pipeline specifications as natural gas imported from other sources; therefore, any differences in criteria pollutant or toxic air contaminant emissions on a per-volume basis are expected to be minimal.

Because there are relatively few LNG vehicle refueling stations in the SCAB, the proposed project could trigger an increased use of LNG in vehicles. This increased use of LNG could be coupled with a corresponding decrease in the use of diesel fuel or gasoline.

Possible candidates for LNG-powered vehicles in the future and the potential air quality impacts associated with the substitution of LNG for diesel or gasoline in vehicles are discussed below.

Local LNG Vehicle Fuel Use – Large numbers and concentrations of diesel-fueled vehicles (e.g., container trucks) and off-road equipment (e.g., yard hostlers) work in and around the Port district. The POLB encourages tenants to reduce mobile source diesel-fuel emissions by using alternative diesel fuels, and installing pollution control devices through the POLB's voluntary Diesel Emission Reduction Program (POLB, undated).

Additionally, the SCAQMD is proposing a Clean Fuels Program to increase the use of alternative fuels. This program has developed a set of fleet vehicle-related rules that would require several categories of fleets to acquire alternative-fuel vehicles if they have more than 14 vehicles. The SCAQMD has also entered into contracts for four LNG fueling stations (SCAQMD, 2003d), each of which must be able to provide at least 50,000 gpd.

State LNG Vehicle Fuel Use – Two thousand heavy-duty trucks in California already run on LNG. The number of LNG-fueled vehicles is expected to increase enough to demand 120,000 gpd (44 million gallons per year) in 2005, of which half would be in southern California. The CEC Transportation Fuels Office estimates that between 0.33 and 0.66 billion gallons of LNG per year would be needed by 2010 to power these vehicles. This increasing use of LNG-fueled vehicles is being encouraged by the CARB's Carl Moyer Program. The Carl Moyer Program provides funding to fleets that propose to refit their heavy-duty engines to use LNG and other alternative fuels. At this time, LNG used in California comes from eight liquefaction plants located in California and other western states. The proposed LNG terminal would be the first facility in California to import LNG rather than convert it from locally available natural gas. Five facilities in California offer LNG for vehicle use, of which only two are located in the SCAB.

National LNG Vehicle Fuel Use – The EPA promotes and expands the use of environmentally-beneficial alternative fuels and vehicles by providing the states with tools such as benefits models, SIP Credits, and the Clean Fuels Fleet Program.

Potential Regional Air Quality Impact

Determining the potential impacts or benefits of introducing LNG into the regional vehicle fleet is difficult for the following reasons:

- it is uncertain what the future demand of project-supplied LNG would be;

- it is uncertain how much of the project-supplied LNG would replace gasoline or diesel use, instead of simply replacing LNG from more distant LNG refueling stations;
- the difference in emissions between LNG vehicles versus gasoline or diesel vehicles depends on the type of vehicle, the age of the engine, and whether any emission control equipment has been installed; and
- increasingly tighter emission and fuel standards, particularly for diesel, will result in lower emissions in the future, and a gradual narrowing of the differences between diesel, gasoline, and alternative-fueled vehicle emissions.

In general, the emissions from LNG-powered vehicles are currently less than the emissions from comparable diesel-powered vehicles with the exception of ROC and methane emissions. However, the difference in PM₁₀ and SO₂ emissions between LNG- and diesel-fueled vehicles would be reduced when the diesel fuel sulfur content level is reduced to 15 ppmw starting in June 2006.

LNG vehicle emissions are comparable to gasoline vehicle emissions with the exception of ROC. The ROC emissions from LNG vehicles are lower than those of gasoline vehicles because LNG vehicles do not have evaporative emissions (CARB, 2004).

SES presented an upper-limit example based on the current differences in in-use emissions between LNG and diesel-fueled trucks. For the example, SES assumed the following:

- A vehicle fleet age distribution and emissions profile used by the CARB in the EMFAC2002 emissions software, Version 2.2 for Los Angeles County for the year 2010.
- 150,000 gallons of project-supplied LNG would be made available for vehicle fuel each day or 54,750,000 gallons per year and that all of the LNG made available would replace diesel fuel.
- Heavy-duty on-road trucks get approximately 2.76 miles per gallon of LNG (Engine, Fuel, and Emissions Engineering, Incorporated, 1996), and could therefore travel approximately 530,000 miles per day on the LNG.

If LNG were used instead of diesel fuel to power these trucks based on the assumptions listed above, the resulting potential changes in regional emissions would be as follows:

- NO_x emissions would decrease by 8,528 pounds per day or 1,556 tons per year;
- ROC emissions would increase by 813 pounds per day or 148 tons per year;
- PM₁₀ emissions would decrease by 51 pounds per day or 9 tons per year;
- SO_x emissions would decrease by 16 pounds per day or 3 tons per year; and
- CO emissions would decrease by 3,227 pounds per day or 589 tons per year.

It should be noted that these differences in emissions are expected to narrow considerably in future years as tighter diesel emissions standards and tighter fuel formulation standards are phased in, and diesel retrofit emission control technologies improve (CARB, 2004).

4.10 NOISE

4.10.1 Significance Criteria

Impacts on environmental noise levels would be considered significant if:

- noise attributable to the operation of the project facility would exceed a day-night sound level (L_{dn}) of 55 decibels of the A-weighted scale (dBA) at nearby noise-sensitive areas (NSAs), such as residences, schools, hospitals, or other occupied dwellings; or
- project-related noise exceeds the City of Long Beach noise threshold of 70 dBA within the Harbor District or if there is an increase in noise of more than 3 dBA in areas where ambient noise exceeds the City of Long Beach noise thresholds.

4.10.2 Environmental Setting

Project-related noise would affect the local environment during construction of the proposed project facilities and during operation of the LNG terminal. At any location, both the magnitude and frequency of environmental noise may vary considerably over the course of the day and throughout the week. This variation is caused by changing weather conditions, and changing human activities. Two measures used by federal agencies to relate the time-varying quality of environmental noise to its known effect on people are the 24-hour equivalent sound level ($L_{eq(24)}$) and the L_{dn} . The $L_{eq(24)}$ is the level of steady sound with the same total (equivalent) energy as the time-varying sound of interest, averaged over a 24-hour period. The L_{dn} is the $L_{eq(24)}$ with 10 dBA added to nighttime sound levels between the hours of 10 p.m. and 7 a.m. to account for people's greater sensitivity to sound during nighttime hours.

The proposed project facilities would be located in a designated industrial zone within the POLB. The nearest NSAs are potential residences in a recreational vehicle park about 1.3 miles east-northeast of the LNG terminal site and possible live-aboard boats at two marinas in the East Basin of the Cerritos Channel between 1.2 and 1.6 miles northwest of the LNG terminal (see figure 4.9.2-2).

To characterize the existing sound levels in the vicinity of the proposed LNG terminal, a property boundary noise survey was conducted at two locations over three time periods during August 2003. The existing noise levels at the property boundary at these two locations are listed in table 4.10.2-1.

TABLE 4.10.2-1			
Summary of Existing Property Boundary Noise Levels Near the Proposed LNG Terminal Site			
Location/Parameter	August 21 - 22, 2003	August 22 - 23, 2003	August 23 - 24, 2003
Pier T East (100 feet east of the eastern property boundary)			
Existing L_{eq} (dBA)	56.1	56.4	54.0
Existing L_{dn} (dBA)	61.1	61.2	59.8
Existing Max. 1 hr. L_{eq} (dBA) ^a	60.2	63.3	57.6
Pier T North (50 feet north of the northern property boundary)			
Existing L_{eq} (dBA)	61.2	60.8	55.9
Existing L_{dn} (dBA)	64.2	63.6	61.1
Existing Max. 1 hr. L_{eq} (dBA) ^a	66.7	67.5	60.8
^a Maximum 1 hour equivalent A-weighted sound level.			

4.10.3 Regulatory Requirements

In 1974, the EPA published *Information on Levels of Environmental Noise Requisite to Protect Public Health and Welfare with an Adequate Margin of Safety*. This publication evaluates the effects of environmental noise with respect to health and safety. The document provides information for state and local governments to use in developing their own ambient noise standards. The EPA has determined that noise levels should not exceed an L_{dn} of 55 dBA, which is the level that protects the public from indoor and outdoor activity interference. The FERC has adopted the EPA's L_{dn} noise level standard.

FERC Guidelines

FERC guidelines (Title 18 CFR Part 380.12) indicate that L_{dn} noise levels must not exceed 55 dBA at the nearest NSA. Due to the 10 dBA nighttime penalty added before the calculation of the L_{dn} , the actual constant noise level required to produce an L_{dn} of 55 dBA is 48.6 dBA. Therefore, compliance with the FERC guidelines of an L_{dn} of less than 55 dBA at the nearest NSA requires that the facility be designed so that the continuous operational noise levels do not exceed 48.6 dBA.

City of Long Beach Municipal Code

As discussed in section 1.4.5, the City of Long Beach Municipal Code sets limits for exterior noise levels based on receiving land use districts. The project facilities would be located in an industrial land use district (District 4) associated with the POLB. In a District 4 zone, the noise limit is 70 dBA at the facility property boundary. The code also specifies a requirement that if the noise contains a steady audible tone such as a whine, screech, or hum or a repetitive noise such as hammering or riveting, the standard limit would be reduced by 5 dBA.

The City of Long Beach also prohibits the operation of equipment that creates vibrations that can be perceived by an individual on private property at the property boundary or at 150 feet if on public space or right-of-way.

4.10.4 Impact and Mitigation

Potential impacts associated with the Long Beach LNG Import Project could be caused by short-term increases in noise during construction of the project facilities and increases in noise levels associated with operation of the LNG terminal.

Construction

Construction of the project facilities would occur over a 48-month period. The soil/foundation improvement activities followed by construction of the LNG storage tanks and terminal would take place during the entire construction period. Construction of the ship berth and unloading facility would take approximately 12 months and would occur in the early portion of the project schedule. Construction of the pipelines and electric distribution facilities would take approximately 10 months and would occur toward the middle of the 48-month construction period. The noise associated with these construction activities would be intermittent, as equipment would be operated on an as-needed basis. Construction activities at the LNG terminal and along the routes of the pipeline and electric distribution facilities would generate short-term increases in sound levels during daylight hours, when construction activities would occur.

The strongest source of sound during construction would be noise associated with installing deep-driven pile foundations beneath the LNG storage tanks and other heavy load structures to meet the

stringent static-settlement criteria for the LNG storage tanks and other heavy load structures at the LNG terminal. Pile driving is estimated to produce a sound pressure level of 100 dBA at a distance of 50 feet. Noise from pile driving is impulsive in nature and rapidly decreases to below the ambient noise levels at a rate of approximately 6 dBA per doubling of distance. The shortest distance from the pile driving to the POLB property line is approximately 5,000 feet. Using the following calculation [sound pressure level 2 = sound pressure level 1 - 20 log (distance 2 / distance 1)], the estimated noise at the POLB property line due to pile driving would be 60 dBA.

The actual sound level impacts from construction activities would depend on the type of equipment used, the mode of operation of the equipment, the length of time the equipment is in use, the amount of equipment used simultaneously, and the distance between the sound source and the receptor. All of these factors would be constantly changing throughout the construction period, making the calculation of an L_{dn} or L_{eq} difficult. Assuming the pile driving is the loudest noise source, and utilizing the above noise attenuation equation, the estimated noise impact due to pile driving at the nearest NSA is 57.3 dBA. FERC does not regulate construction noise and 57.3 dBA is below the City of Long Beach noise limits, of which construction noise in the Long Beach Harbor District is exempt. Although the noise levels at the property boundary would be higher than existing noise levels, the impacts would be short term and would be contained within the industrial area immediately surrounding the LNG terminal site within the POLB. As a result, impacts on noise levels associated with construction of the proposed facilities would be less than significant.

Operation

The major noise-producing equipment associated with operation of the LNG terminal would be the boil-off gas compressors, primary and secondary booster pumps, water pumps and heaters, instrument air compressors, and fans for the heaters. All of the equipment has been specified to produce a noise level of no greater than 85 dBA at 3 feet.

Noise control measures included in the design of the LNG terminal facilities consist of buildings, barrier walls, and tanks to provide the appropriate level of noise screening.

A preliminary noise study was conducted to predict the operational noise levels at the nearest NSA and at the property boundary for comparison with existing noise levels and the FERC and City of Long Beach noise limits. A noise model was developed for the LNG terminal using SoundPlan, which is an industry accepted noise prediction model. Buildings and barriers were included in the model to estimate noise absorption and reflection associated with the LNG terminal facilities. The noise model calculations were based on the hemispherical radiation of noise from each source.

The results of the preliminary noise study indicate that the LNG terminal facilities would have a noise level impact of 55 dBA L_{dn} approximately 0.25 mile from the terminal property boundary (still within the POLB). The nearest NSAs are located over 1 mile from the property boundary. As a result, the project would be in compliance with the FERC limit of 55 dBA L_{dn} at the nearest NSAs.

The predicted property boundary noise levels were estimated to be 60 dBA, which would be less than the 70 dBA property boundary noise limit required by the City of Long Beach. As a result, the project would be in compliance with the City of Long Beach noise ordinance.

Summary

The predicted operational noise level is below the FERC limit of 55 dBA L_{dn} at the nearest NSAs. The predicted property boundary noise level is below the City of Long Beach noise limit of 70 dBA. In

addition, vibration monitoring at other LNG terminals has shown that significant vibrations are not produced by operation of the facilities. As a result, noise impacts associated with operation of the proposed LNG terminal facilities would be less than significant.

To ensure that the actual noise resulting from the operation of the LNG terminal is below the FERC limit of 55 dBA L_{dn} at any nearby NSAs and the City of Long Beach property boundary noise limit of 70 dBA, **the Agency Staffs will recommend to their respective Commissions that the following measure be included as a specific condition of any approvals issued by the FERC and the POLB:**

- **SES shall conduct a noise survey to verify that the noise from the LNG terminal when operating at full capacity does not exceed an L_{dn} of 55 dBA at any nearby NSAs or 70 dBA at the property boundary, and file the results of the noise survey with the FERC and the POLB no later than 60 days after placing the LNG terminal in service. If the noise attributable to the operation of the LNG terminal exceeds an L_{dn} of 55 dBA at any nearby NSA or 70 dBA at the property boundary, SES shall file a report on what changes are needed and shall install additional noise controls to meet these levels within 1 year. SES shall confirm compliance with the L_{dn} of 55 dBA at the nearby NSAs and 70 dBA at the property boundary requirements by filing a second noise survey with the FERC and the POLB no later than 60 days after it installs the additional noise controls.**

4.11 RELIABILITY AND SAFETY

This section contains both the FERC's and POLB's analyses of the safety aspects of the proposed project because the EIS/EIR is designed to meet the requirements of both NEPA and CEQA. This means that the format and type of information presented in this document differ substantially from the safety analyses that the FERC prepares for other proposed LNG terminals. There are significant distinctions between the FERC and POLB analyses that are discussed below.

The first analysis was prepared by the FERC as part of its overall NEPA review of the proposed facilities. The second analysis was prepared by the POLB to meet the requirements of the CCA, as implemented in the RMP in the PMP. The POLB's safety review is based upon a hazards analysis prepared for the POLB by Quest to comply with the RMP, which specifies that probable worst-case scenarios must be considered.

The FERC's analysis is presented in sections 4.11.2 through 4.11.9. Regarding the LNG terminal, the FERC staff performed a siting analysis, as well as an overall safety, operability, and reliability analysis. The siting analysis determines if the proposal meets the requirements of the DOT's regulations in Title 49 CFR 193 and NFPA 59A. This includes verification of: LNG impoundment capacities; equipment spacing; design spills; and thermal and flammable vapor exclusion zones. In addition, the FERC's review determines areas of hazard with respect to LNG spills from ships. Results from the ship spill analysis are estimates of consequences from a range of intentional breach scenarios that provide guidance in developing the safety and security requirements for LNG vessel transport, as well as in establishing potential impact areas for emergency response and evacuation planning.

The POLB's analysis under CEQA is included with the FERC staff's except where it differs due to the POLB's hazard assessment by Quest, which is summarized in section 4.11.10 and attached in its entirety as Appendix F. This hazards analysis considers different worst-case scenarios and reveals different consequences than does the FERC's analysis. The CCA analysis that the POLB must prepare is also based upon the Quest study in Appendix F. It is presented in section 5.0 and is termed the Application Summary Report.

The FERC staff does not agree with analyzing worst-case, high-consequence, low-probability events without accounting for the beneficial effect of preventive or mitigation measures as part of a risk management process. As a result, many of the worst-case high consequences calculated in the Hazards Analysis by Quest are not considered credible events by the FERC.

4.11.1 Significance Criteria

Impacts on public safety would be considered significant if project construction or operation would:

- result in a substantial increase in the potential for incidents that would cause serious injury or death to members of the public; or
- substantially diminish the level of fire and police services (reduction of acceptable response times).

4.11.2 LNG Import Terminal Facilities

Three federal agencies share in the oversight of the safety and security of LNG import terminals: the Coast Guard, the PHMSA of the DOT, and the FERC. The FERC authorizes the siting and

construction of LNG import terminals and is the lead federal agency under NEPA to analyze the environmental, safety, security, and cryogenic design of proposed facilities. The Coast Guard has authority over the safety of LNG vessels and the marine transfer area. The Coast Guard also has authority over the security of the LNG vessels and the entire LNG facility. The PHMSA has exclusive authority to promulgate and enforce safety regulations and standards over the onshore LNG facilities beginning at the last valve immediately before the LNG storage tank(s).

In February 2004, these three agencies entered into an Interagency Agreement to assure that they work in a coordinated manner to address the full range of issues regarding safety and security at LNG import terminals, including the terminal facilities and ship operations, and to maximize the exchange of information related to the safety and security aspects of the LNG facilities and related marine operations. The Interagency Agreement ensures a seamless safety and security review by the three participating federal agencies.

The operation of the proposed LNG terminal poses a potential hazard that could affect the public safety without strict design and operational measures to control potential incidents such as accidental and intentional releases. The primary concerns are those events that could lead to an LNG spill of sufficient magnitude to create an offsite hazard.

With the exception of the October 20, 1944 fire at an LNG facility in Cleveland, Ohio, the operating history of LNG facilities in the United States has been free of LNG safety-related incidents resulting in adverse effects on the public or the environment.⁵ More recently, an operational accident occurred in 1979 at the Cove Point LNG facility in Lusby, Maryland, when a pump seal failed, resulting in gas vapors entering an electrical conduit and settling in a confined space. When a worker switched off a circuit breaker, the gas ignited, resulting in heavy damage to the building and a worker fatality. Lessons learned from this accident resulted in changing the national fire codes, with the participation of the FERC, to ensure that the situation would not occur again. The proposed facilities would be designed, constructed, and operated in compliance with these codes.

On January 19, 2004, a blast occurred at Sonatrach's Skikda, Algeria LNG liquefaction facility that killed 27 workers and injured another 56 workers. No members of the public were injured. Preliminary findings of the accident investigation suggest that a cold hydrocarbon leak occurred and was introduced to the high-pressure steam boiler by the combustion air fan. An explosion inside the boiler fire box subsequently triggered a larger explosion of the hydrocarbon vapors in the immediate vicinity. The resulting fire damaged the adjacent liquefaction process and liquefied petroleum gas (LPG) separation equipment. Although much of the plant had been modernized in 1998-1999, the facilities in which the explosion occurred had been operating with its original equipment since start-up in 1981.

Although there are major differences between the equipment involved in the accident at Skikda and that of the proposal by SES (i.e., high-pressure steam boilers that power refrigerant compressors would not be used nor are they used at any LNG facility under FERC jurisdiction), the sequence of cascading events identifies potential failure modes that warrant further evaluation. This issue was discussed at the July 14, 2004 cryogenic design and technical review conference conducted for SES' proposed project in Long Beach, California. To ensure that all potential hazards are addressed, the FERC staff provided a recommendation in section 4.11.6 to address this issue.

⁵ For a description of the incident and the findings of the investigation, see U.S. Bureau of Mines, *Report on the Investigation of the Fire at the Liquefaction, Storage, and Regasification Plant of the East Ohio Gas Co., Cleveland, Ohio, October 20, 1944, and February 1946.*

4.11.3 LNG Hazards

LNG's principal hazards result from its cryogenic temperature (-260 °F), flammability, and vapor dispersion characteristics. As a liquid, LNG will neither burn nor explode. Although it can cause freeze burns and, depending on the length of exposure, more serious injury, its extremely cold state does not present a significant hazard to the public, which rarely, if ever, comes in contact with it as a liquid. As a cryogenic liquid, LNG will quickly cool materials it contacts, causing extreme thermal stress in materials not specifically designed for ultra-cold conditions. Such thermal stresses could subsequently subject the material to brittleness, fracture, or other loss of tensile strength. These hazards, however, are not substantially different from the hazards associated with the storage and transportation of liquid oxygen (-296°F) or several other cryogenic gases that are routinely produced and transported in the United States.

Methane, the primary component of LNG, is colorless, odorless, and tasteless, and is classified as a simple asphyxiant. Methane could, however, cause extreme health hazards, including death, if inhaled in significant quantities within a limited time. At very cold temperatures, methane vapors could cause freeze burns. Asphyxiation, like freezing, normally represents a negligible risk to the public from LNG facilities.

When released from its containment vessel and/or transfer system, LNG will first produce a vapor or gas. This vapor, if ignited, represents the primary hazard to the public. LNG vaporizes rapidly when exposed to ambient heat sources such as water or soil, producing 620 to 630 standard cubic feet of natural gas for each cubic foot of liquid. LNG vapors in a 5 to 15 percent mixture with air are highly flammable. The amount of flammable vapor produced per unit of time depends on factors such as wind conditions, the amount of LNG spilled, and whether it is spilled on water or land. Depending on the amount spilled, LNG may form a liquid pool that will spread unless contained by a dike.

Once a flammable vapor-air mixture from an LNG spill has been ignited, the flame front will propagate back to the spill site if the vapor concentration along this path is sufficiently high to support the combustion process. An unconfined methane-air mixture will burn slowly, tending to ignite combustible materials within the vapor cloud. Thermal radiation is the primary mechanism of heat transfer from the burning methane to an individual or structure.

LNG is not explosive as it is normally transported and stored. However, LNG vapors (primarily methane) can explode if contained within a confined space, such as a building or structure, and ignited. There is no evidence, however, suggesting that LNG is explosive in unconfined open areas. Experiments to determine if unconfined methane-air mixtures will explode have been conducted and, to date, have all been negative. Unconfined methane-air mixtures will burn but will not explode. Nevertheless, a number of experimental programs have been conducted to determine the "amount of initiator charge" required to detonate an unconfined methane-air mixture.

Over the years, various parties have occasionally expressed the energy content of an LNG storage tank or LNG ship in equivalent tons of tri-nitro toluene (TNT), as an implied measure of its explosive potential. However, such a simplistic analogy fails to consider that explosive forces are not just a function of the total energy content but also of the rate of energy release. For an explosion to occur, the rate of energy release must be nearly instantaneous, such as with a TNT charge initiated by a blasting cap. Unlike TNT or other explosives that inherently contain an oxidizer, an unconfined vapor cloud must be mixed with oxygen within the flammability range of the fuel for combustion to occur. For a large unconfined vapor cloud, the flammability range tends to exist at the mixing zone at the edges of the cloud. When ignited, flame speeds about 20 to 25 meters per second (66 to 82 feet per second) and local overpressures up to 0.2 psig have been estimated for methane rich fuels, well below the flame speeds and overpressures associated with explosion.

Rapid phase transition (RPT) can occur when a portion of LNG spilled onto water changes from liquid to gas, virtually instantaneously. Unlike an explosion that releases energy and combustion products from a chemical reaction as described above, RPT is the result of heat transferred to the liquid inducing a change to the vapor state. The rapid expansion from the liquid to vapor state can cause locally large overpressures. RPTs have been observed during LNG test spills onto water. In some test cases, the overpressures generated were strong enough to damage test equipment in the immediate vicinity of the LNG release point. The sizes of the overpressure events have been generally small, and are estimated to be equivalent to several pounds of TNT. Such a small overpressure is not expected to cause significant damage to an LNG vessel. However, the RPT may increase the rate of LNG pool spreading and the LNG vaporization rate.

4.11.4 Storage and Retention Systems

LNG storage tanks come in a variety of categories. The following are descriptions of the tank designs most commonly used worldwide:

- single containment cylindrical metal tanks (predominantly used in the United States);
- spherical storage tanks (predominantly used in LNG carriers);
- double containment cylindrical metal inner tank and metal or concrete outer tank (commonly thought of as an LNG tank with a high wall dike);
- full containment cylindrical metal inner tank and metal or concrete outer tank (Cameron/Hackberry was the first project proposing this design in the United States; Freeport LNG was the second; and currently, numerous LNG projects are proposing this type of tank design, including SES' proposal);
- prestressed cylindrical concrete tank with an internal metal membrane (membrane tank) (none in the United States); and
- cryogenic cylindrical concrete tank; internal cryogenic tank and prestressed concrete outer tank (one operational in the United States; the remainder worldwide).

These tank categories are described in Annex H of the European Standard for LNG facilities (EN 1473) and are summarized below for the LNG storage tanks commonly found in proposals before the Commission. The numbering of the tank examples discussed below is based on the numbering system used in EN 1473.

H.1 Single containment tank

A single primary container and generally an outer shell designed and constructed so that only the primary container is required to meet the low temperature ductility requirements for storage of the product.

The outer shell of a single containment storage tank is primarily for the retention and protection of insulation and to contain the purge gas pressure, but is not designed to contain refrigerated liquid in the event of leakage from the primary container.

An aboveground single containment tank shall be surrounded by a bund (dike) wall to contain any leakage. Examples of single containment tanks are given in figure H.1.

H.3 Double containment tank

A double containment tank is designed and constructed so that both the inner self supporting primary container and the secondary container are capable of independently containing the refrigerated liquid. To minimize the pool of escaping liquid, the secondary container shall be located at a distance not exceeding 6 meters from the primary container.

The primary container contains the refrigerated liquid under normal operating conditions. The secondary container is intended to contain any leakage of the refrigerated liquid, but it is not intended to contain any vapor resulting from this leakage.

Examples of double containment tanks are given in figure H.3. Figure H.3 does not imply that the secondary container is necessarily as high as the primary container.

H.4 Full containment tank

A tank designed and constructed so that both the self supporting primary container and the secondary container are capable of independently containing the refrigerated liquid stored and for one of them its vapor. The secondary container can be 1 or 2 meters distance from the primary container.

The primary container contains the refrigerated liquid under normal operating conditions. The outer roof is supported by the secondary container. The secondary container shall be capable both of containing the refrigerated liquid and of controlled venting of the vapor resulting from product leakage after a credible event. Examples of full containment tanks are given in figure H.4.

Single-, double- and full-containment LNG storage tanks have been authorized by the FERC for use at new LNG import facilities or expansions of existing terminals. To date, only single- and double-containment tanks have been constructed and operated. Although construction of full-containment tanks has not yet started in the United States, approximately 50 have been constructed worldwide. During the review of earlier proposals, a number of issues surfaced concerning the applicability of existing codes and regulations to full-containment tanks. Specifically, the term “full containment” does not appear in U.S. codes or standards for LNG facilities, including the Federal Safety Standards in Title 49 CFR Part 193, NFPA 59A, or API 620. As a result, some project proponents have made the assumption that to design and construct a full-containment tank in accordance with the European code for LNG facilities (EN 1473) will satisfy the U.S. codes and standards.

For example, it has been suggested that thermal exclusion zones are not required for a full-containment tank because EN 1473 does not consider a tank fire scenario for full-containment tanks with a pre-stressed concrete wall and concrete roof. The staffs of the FERC and the OPS do not agree because neither NFPA 59A nor Part 193 excludes full containment from thermal exclusion zone requirements. As a result, a thermal exclusion zone analysis is required for an LNG storage tank fire at the top of the secondary container (see section 4.11.5).

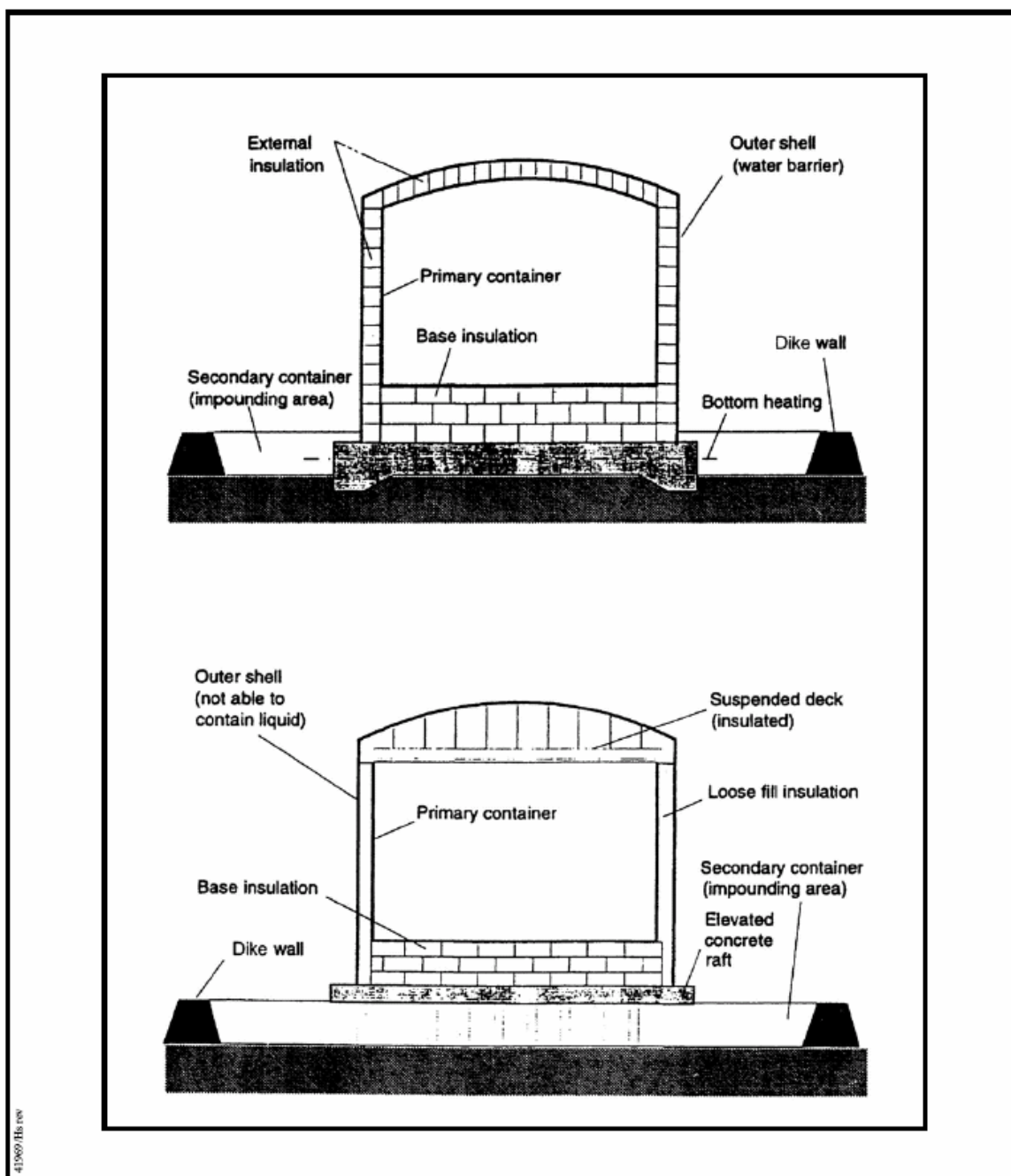


Figure H.1

Examples of Single Containment Tanks

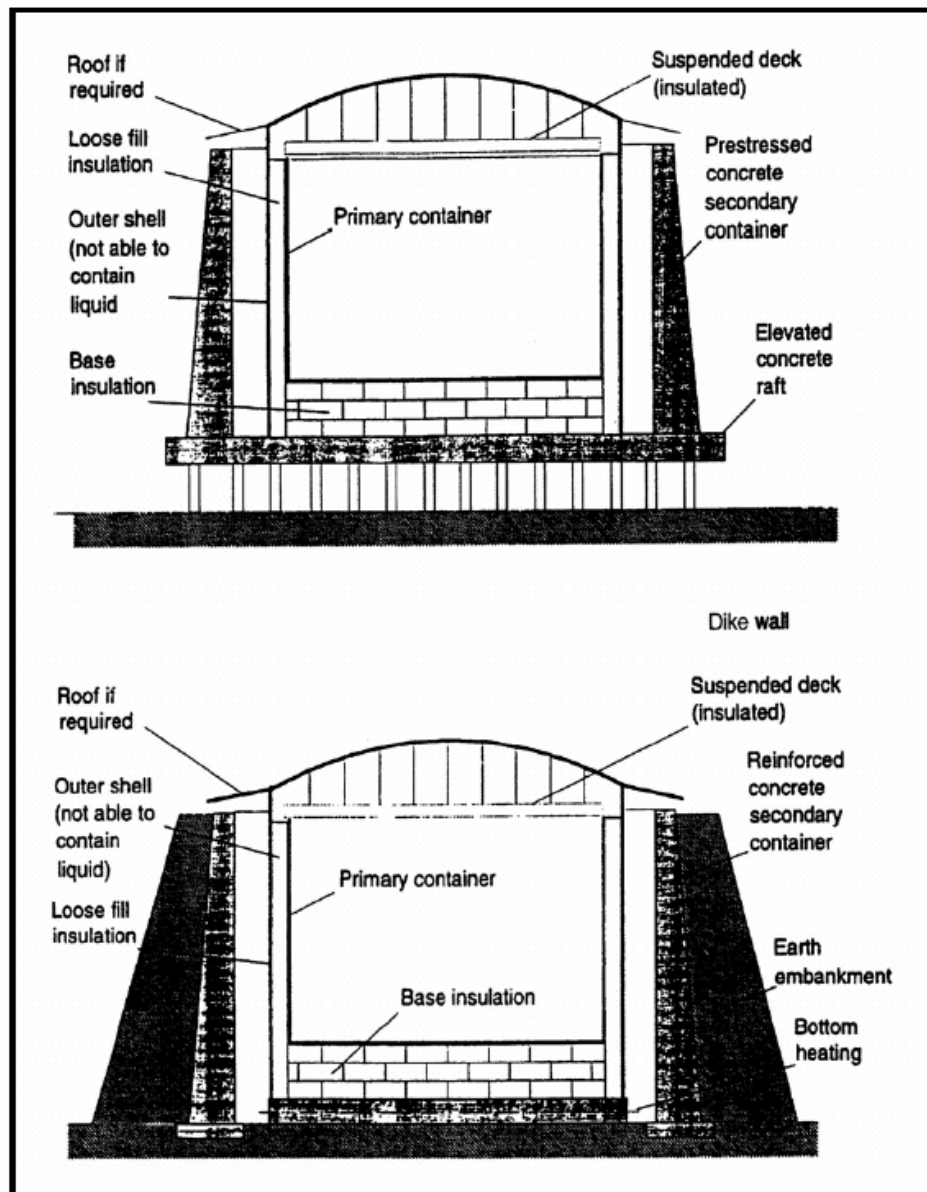


Figure H.3

Examples of Double Containment Tanks

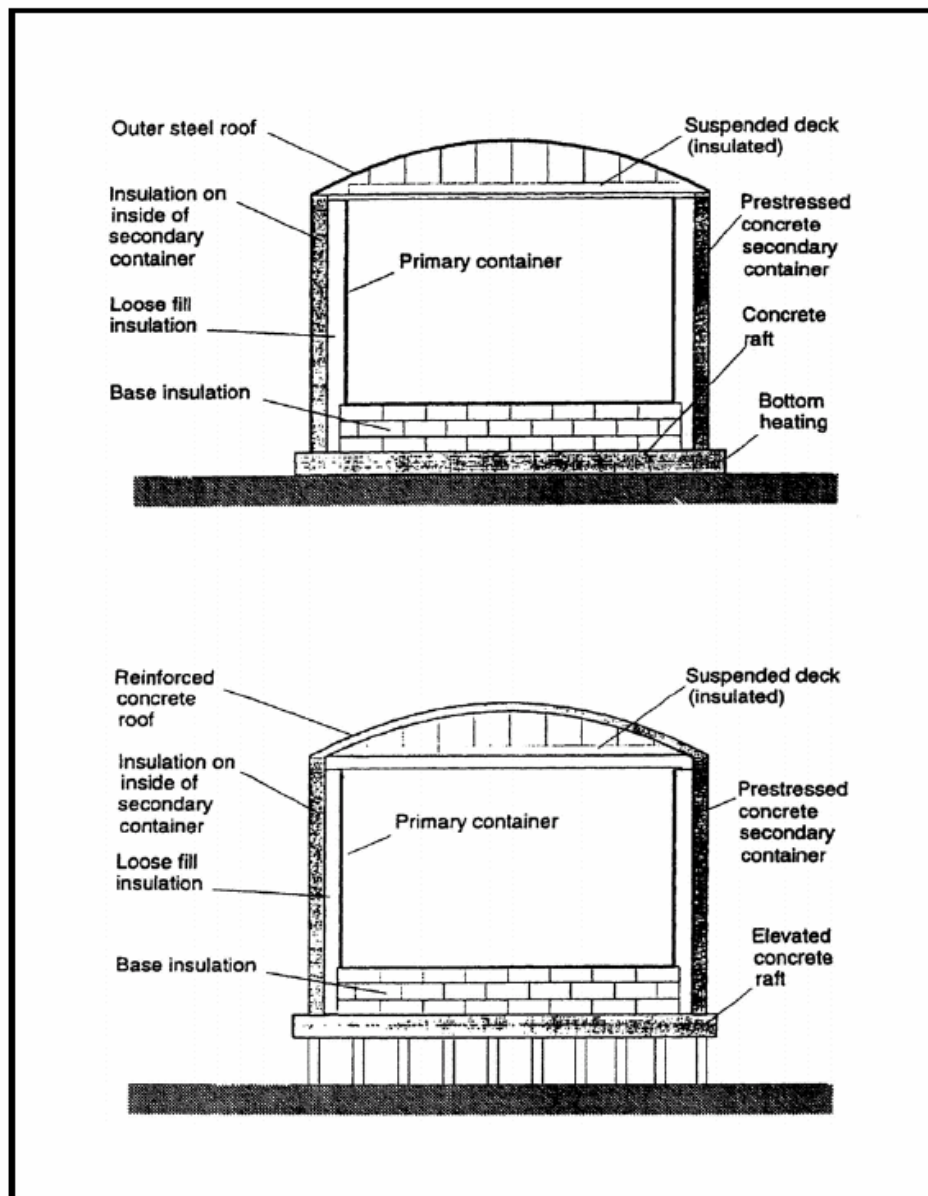


Figure H.4

SES Long Beach LNG Import Project

Examples of Full Containment Tanks

Further, EN 1473 does not specify a minimum distance to the property line for full-containment tanks because no tank fire scenario is considered. However, NFPA 59A requires a separation of 0.7 times the tank diameter from the property line. SES' proposed tank separation distance to the property line meets this separation requirement.

Another issue regarding the full-containment design is that the tank outer wall (secondary containment) serves as the impoundment, a concept allowed under Parts 193.2161 and 193.2167, and under the "exception" in figure 2.2.2.6 of NFPA 59A. A specific concern is the dual function of the concrete secondary container - it serves both the operational function of holding the insulation and gas pressure, and a safety function of containing liquid in the event of an inner tank failure. Conversely, in single- and double-containment tanks, independent systems provide operational and safety functions. While recognition must be given to the benefits of a concrete secondary container with respect to external events, such as projectiles or small aircraft, its ability to provide the dual functions while retaining its integrity has not been convincingly supported for all scenarios. This becomes increasingly important as proposed site acreage is reduced and buffer zones between adjacent properties are minimized. As such, the FERC staff considers it prudent design practice to provide some form of barrier to prevent liquid from flowing to an unintended area (i.e., outside the plant property) in the event that the storage tank primary and secondary containers fail.

Concerns have also been expressed that the barrier could be considered a containment and prohibit certain equipment being located within the barrier and/or may conflict with other parts of the various codes with respect to hazardous and electrical code classifications. Other concerns are that the barrier could be considered an impounding area that would require new thermal and vapor cloud calculations. The purpose of the barrier is to prevent liquid from flowing off the plant property, and it is not the intent to define a containment or impounding area for thermal radiation or flammable vapor exclusion zone calculations or other code requirements.

SES proposes to install a security barrier wall around the LNG storage tanks. The structure would have a height of 20 feet and would enclose an area approximately 805 feet by 440 feet. The structure's volumetric capacity would exceed 100 percent of a single LNG tank's maximum liquid capacity. Rainwater that collects inside the barrier wall would be drained into a sump and pumped out in accordance with Title 49 CFR Part 193.2173. This barrier would confine LNG on the project site in the event of any hypothetical catastrophic event.

4.11.5 Siting Requirements – Thermal and Vapor Dispersion Exclusion Zones

Regulatory Requirements

The LNG facilities proposed for the Long Beach LNG Import Project must comply with the siting requirements of Title 49 CFR Part 193, Subpart B. On March 30, 2000, the DOT revised Title 49 CFR Part 193 to incorporate NFPA 59A (1996 edition) into the LNG regulations. On April 9, 2004, the DOT further revised Title 49 CFR Part 193 to incorporate the 2001 edition of NFPA 59A. The following sections specifically address offsite hazards:

- **Part 193.2001, Scope of Part,** excludes any matter other than siting provisions pertaining to marine cargo transfer systems between the marine vessel and the last manifold or valve immediately before a storage tank.
- **Part 193.2051, Scope,** states that each LNG facility designed, replaced, relocated, or significantly altered after March 31, 2000, must be provided with siting requirements in

accordance with Subpart B and NFPA 59A. In the event of a conflict with NFPA 59A, Part 193 prevails.

- **Part 193.2057, Thermal radiation protection,** requires that each LNG container and LNG transfer system have thermal exclusion zones based on three radiation flux levels in accordance with section 2.2.3.2 of NFPA 59A.
- **Part 193.2059, Flammable vapor-gas dispersion protection,** requires that each LNG container and LNG transfer system have a dispersion exclusion zone in accordance with sections 2.2.3.3 and 2.2.3.4 of NFPA 59A.

For the following LNG facilities that are proposed in this project, the FERC staff has identified the applicable siting requirements from Part 193 and NFPA 59A:

- Two 1,006,000-barrel LNG storage tanks and one 23,901-barrel trailer truck loading LNG storage tank - Parts 193.2057 and 2059 require the establishment of thermal and flammable vapor exclusion zones for LNG tanks. NFPA 59A section 2.2.3.2 specifies four thermal exclusion zones based on the design spill and the impounding area. Sections 2.2.3.3 and 2.2.3.4 specify a flammable vapor exclusion zone for the design spill, which is determined in section 2.2.3.5.
- One marine unloading berth and a cargo transfer system consisting of four 16-inch-diameter unloading arms, and one transfer line - Parts 193.2001, 2057, and 2059 require thermal and flammable vapor exclusion zones for the transfer system. NFPA 59A does not address LNG transfer systems.
- One trailer truck loading transfer facility consisting of two loading stations - Parts 193.2001, 2057, and 2059 require thermal and flammable vapor exclusion zones for the transfer system. NFPA 59A section 2.2.3.2 specifies the thermal exclusion zone and sections 2.2.3.3 and 2.2.3.4 specify the flammable vapor exclusion zone based on the design spill in a transfer area.
- Six 2,500 gpm in-tank pumps (three in each tank), seven 1,830 gpm primary booster pumps, and seven 1,980 gpm secondary booster pumps - Parts 193.2057 and 2059 require thermal and flammable vapor exclusion zones. NFPA 59A section 2.2.3.2 specifies the thermal exclusion zone and sections 2.2.3.3 and 2.2.3.4 specify the flammable vapor exclusion zone based on the design spill in a process area.
- Four shell and tube vaporizers - Same requirements as for LNG pumps.

The incorporation of the NFPA 59A requirements into Title 49 CFR Part 193 has resulted in some confusion and possible misinterpretation in applying the siting requirements.

Parts 193.2057 and 2059 require exclusion zones for LNG transfer systems, which are defined to include transfer piping. However, NFPA 59A only requires exclusion zones for “transfer areas,” which are defined as the part of the plant where liquids are introduced or removed from the facility such as trailer truck loading or ship unloading areas. The definition of transfer area in NFPA 59A specifically excludes permanent plant piping such as cargo transfer lines. Additionally, NFPA 59A section 2.2.3.1 (2001) specifically excludes transfer areas at the water edge of marine terminals. When the DOT incorporated NFPA 59A into its regulations, it removed the requirement for impounding systems around transfer piping (old Part 193.2149). In the preamble to the final rule, the DOT determined that the most

likely sources of leaks within LNG plants are LNG storage tanks, cargo transfer areas, and vaporizers and process equipment, which are all addressed in NFPA 59A section 2.2.1.2. The result is that while Part 193 retains exclusion zones for LNG transfer systems, neither Part 193 nor NFPA 59A requires the impoundment from which to base the calculations. The FERC staff does not believe that this was the intent, nor do they believe that omitting containment for transfer piping is a sound engineering practice. The FERC staff will continue to require containment for all LNG transfer piping within a plant site.

The incorporation of NFPA 59A also changed the way in which design spills and impoundment capacities may be determined. Under section 2.2.2.2, the capacity of impounding areas for vaporization, process, or LNG transfer areas must equal the greatest volume during a 10-minute period from any single accidental leakage source or during a shorter time period based upon demonstrable surveillance and shutdown provisions acceptable to the authority having jurisdiction. Similar criteria appear in section 2.2.3.5 for determining the design spill used in thermal and flammable vapor exclusion zone calculations. Prior to the incorporation of NFPA 59A, the design spill in Part 193 assumed the rupture of a single transfer pipe with the greatest overall flow capacity, for not less than 10 minutes [old Part 193.2059(d)]. As a result, the spill rate for vaporization, process, or LNG transfer areas may be assumed to be a "leakage source" rather than a full pipe rupture; however, the spill duration must be 10 minutes unless the authority having jurisdiction (i.e., the DOT OPS) determines that a shorter time is acceptable. Again, given the confusion in applying the two requirements, the FERC staff will continue to utilize the 10-minute spill criteria at the maximum flow possible for containment sizing. This will ensure that impoundments are sized for a catastrophic failure, while recognizing that less conservative spill scenarios may be appropriate for exclusion zone calculations. In giving recognition to the integrity of all-welded transfer piping, the determination of the single accidental leakage source should be based on an evaluation of all small diameter attachments to the transfer piping for instrumentation, pressure relief, recirculation, etc, and any flanges that may be used at valves or other equipment, in order to determine the largest spill rate. This approach is the result of discussions with the DOT OPS concerning the basis for design spills and application to exclusion zone determinations for proposals before the Commission.

Impoundment Systems and Sizing Spills

The calculations of thermal and flammable exclusion zones for the proposed LNG facilities are based on the dimensions of the proposed impoundment systems and the spill volumes specified by Part 193 and NFPA 59A. Part 193.2181 specifies that the impoundment system serving a single LNG storage tank must have a volumetric capacity of 110 percent of the LNG tank's maximum liquid capacity. SES' proposed LNG storage tank impoundments would be the outer concrete container surrounding the inner container that holds the LNG. Each LNG storage tank's gross liquid capacity is 42,272,000 gallons. The volumetric capacity of the impoundment for each tank would be 53,177,333 gallons, which would exceed the 110 percent requirement by approximately 6,678,133 gallons. Also, SES' proposed trailer truck loading LNG storage tank impoundment would be the outer concrete container surrounding the inner container that holds the LNG. The trailer truck loading LNG storage tank's gross liquid capacity is 1,003,842 gallons. The volumetric capacity of the impoundment for the tank would be 2,108,208 gallons, which would exceed the 110 percent requirement by approximately 1,003,982 gallons.

Potential LNG spills from the ship unloading line, the two LNG storage tank withdrawal headers, and the trailer truck loading tank withdrawal header would be directed to the storage tank impoundment sump. This sump would measure 210 feet long by 25 feet wide with a depth of 17.6 feet and would have a capacity of 691,152 gallons. The sump would be located next to the unloading line pipe rack between the two storage tanks. The flow for the ship unloading line at full rate is 55,031 gpm. This would result in a 10-minute spill of 550,310 gallons. The design spill for an LNG storage tank with no penetrations below the liquid level is determined in accordance with section 2.2.3.5 of NFPA 59A and is defined as the largest flow from any single line that could be pumped into the impounding area. Each LNG storage tank

would be equipped with three in-tank pumps, individually rated for 2,500 gpm. The rupture of the in-tank pump discharge header would result in a spill rate of 7,500 gpm, which equates to a spill volume of 75,000 gallons. The trailer truck loading LNG storage tank would be equipped with two in-tank pumps (one primary and one backup), individually rated for 1,050 gpm. One in-tank pump would be used for transferring LNG to the trailer truck loading area. Rupture of the discharge piping would result in a spill rate of 1,050 gpm, which would equate to a spill volume of 10,500 gallons. The storage tank impoundment sump is adequately sized to contain these spills.

The area around the process area would be graded so that a spill would flow to a collection sump located on the west side of the process area near the midpoint of the process area. The design flow for the sendout line at full rate is 9,598 gpm. This equates to a 10-minute spill of 95,980 gallons. In the process area, this spill would be retained in a sump with the dimensions 35 feet long by 25 feet wide with a depth of 18 feet. The process area sump would have a capacity of 117,810 gallons and would accommodate this spill.

The area around the trailer truck loading area would be curbed and graded so that a spill would flow to a collection sump located next to the loading line pipe rack south of the trailer truck loading station. The design flow rate through the transfer line from the trailer truck loading LNG storage tank to the trailer truck loading area would be 1,050 gpm. This equates to a 10-minute spill of 10,500 gallons. SES' current design for the trailer truck loading area includes a sump that is 10 feet long by 10 feet wide with a depth of 18.8 feet. This sump would have a capacity of 14,062 gallons and would accommodate a 10,500-gallon spill.

Additionally, the design flow for a single trailer truck loading line at full rate is 314 gpm. This equates to a 10-minute spill of 3,140 gallons. The trailer truck loading area sump would accommodate a 10-minute spill from a single trailer truck loading line.

Table 4.11.5-1 presents the design spill sizes and impoundment system capacities.

TABLE 4.11.5-1			
Impoundment Areas			
Source	Spill Size (gallons)	Impoundment System	Impoundment Size (gallons)
LNG Storage Tank	42,272,000	Outer Tank Concrete Wall	53,177,333
Trailer Truck Loading LNG Storage Tank	1,003,842	Outer Tank Concrete Wall	2,108,208
Ship Unloading Line	550,310	Storage Tank Impoundment Sump	691,152
LNG Storage In-tank Pump Header	75,000	Storage Tank Impoundment Sump	691,152
Trailer Truck Loading In-tank Pump Header	10,500	Storage Tank Impoundment Sump	691,152
Process Area	95,980	Process Area Sump	117,810
Trailer Truck Loading Area	10,500	Trailer Truck Loading Area Sump	14,062

Thermal Exclusion Zone

If a large quantity of LNG is spilled in the presence of an ignition source, the resulting LNG pool fire could cause high levels of thermal radiation. Exclusion distances for various flux levels were calculated according to Title 49 CFR Part 193.2057 and section 2.2.3.2 of NFPA 59A, using the "LNGFIRE III" computer program model developed by the Gas Research Institute. NFPA 59A establishes certain atmospheric conditions (0 mph wind speed, 70 °F, and 50 percent relative humidity) that are to be used in calculating the distances. However, Part 193.2057 supersedes these requirements and stipulates that the wind speed, ambient temperature, and relative humidity that produce the maximum

exclusion distances must be used, except for conditions that occur less than 5 percent of the time based on recorded data for the area. For its analysis, SES selected the following ambient conditions from the SCAQMD to produce the maximum distances: wind speed of 8 mph; ambient temperature of 40 °F; and 50 percent relative humidity. These parameters were verified by FERC staff to produce maximum distances.

Thermal radiation distances for incident flux levels ranging from 1,600 to 10,000 British thermal units per square foot per hour (Btu/ft²-hr) were calculated for an LNG storage tank and trailer truck loading LNG storage tank fires. An incident flux level of 1,600 Btu/ft²-hr is considered hazardous for persons located outdoors and unprotected, a level of 3,000 Btu/ft²-hr is considered an acceptable level for wooden structures, and a level of 10,000 Btu/ft²-hr would cause clothing and wood to ignite and is considered sufficient to damage steel structures after several minutes of exposure. Because the outer concrete tanks provides the required impounding volume for both the LNG storage tank and the trailer truck loading LNG storage tank, the area of the impoundment is the appropriate parameter for thermal exclusion zone calculations. For the LNG storage tanks, the outer concrete tank diameter (249.34 feet) was used as the pool diameter, with a flame height to the top of the outer concrete wall (137.47 feet). The target height was set at ground level (0 feet). For the trailer truck loading LNG storage tank, the outer concrete tank diameter (79.0 feet) was used as the pool diameter, with a flame height to the top of the outer concrete wall (57.5 feet). The target height was set at ground level (0 feet). Thermal radiation distances were also determined for a 1,600 Btu/ft²-hr incident flux level centered on the tank area sump, process area sump, and the trailer truck loading area sump. The regulations only require calculation of a 1,600 Btu/ft²-hr exclusion zone distance for these sumps.

Table 4.11.5-2 presents the maximum distances for incident flux levels as calculated by the FERC staff. These values are generally in agreement with those calculated by SES. The exclusion zones for the 10,000 Btu/ft²-hr incident flux would not extend beyond the property line. The storage tank exclusion zone distance for the 1,600 Btu/ft²-hr incident flux would extend outside the terminal site by approximately 438 feet to the east onto Pier T property. The exclusion zone distance for the 3,000 Btu/ft²-hr incident flux also would extend outside the terminal site by approximately 181 feet to the east onto Pier T property. For the trailer truck loading storage tank, the exclusion zone distance for the 1,600 Btu/ft²-hr incident flux would extend outside the terminal site by approximately 167 feet to the east onto Pier T property. The exclusion zone distance for the 3,000 Btu/ft²-hr incident flux extends outside the terminal site by approximately 81 feet to the east onto Pier T property.

Based on the analyses of the thermal radiation from the storage tanks and the trailer truck loading storage tank, several exclusion zone distances (as required by Title 49 CFR Part 193) extend beyond the property line of the facility that can be built upon. Although no prohibited activities or buildings currently exist within these exclusion zones, according to Title 49 CFR Part 193, either a government agency or SES must be able to exercise legal control over activities in these areas for as long as the facility is in operation. The POLB owns the land surrounding the LNG terminal site but leases parcels to other tenants. In its application, SES stated that it is currently negotiating with the POLB and adjacent tenants for restrictive covenants to limit the use of the areas impacted. At this time, there is no assurance of limiting the type of activities that occur outside of the proposed terminal site within the exclusion zones. Therefore, **the FERC staff recommends that:**

- **SES shall provide in its comments on the draft EIS/EIR, or in a separate document submitted at the same time, evidence of its ability to exercise legal control over the activities that occur within the portions of the thermal radiation exclusion zones that fall outside the site property line that can be built upon.**

TABLE 4.11.5-2				
Thermal Exclusion Zones				
Source	Exclusion Area NFPA 59A Section 2.2.3.2(a)	Incident Flux (Btu/ft ² -hr) ^a	Exclusion Zone (feet) ^b	Property Line (feet)
LNG Storage Tank Impoundment	Outdoor assembly area occupied by 50 or more people	1,600	778	340
LNG Storage Tank Impoundment	Offsite structures used for occupancies or residences	3,000	521	340
LNG Storage Tank Impoundment	Property line that can be built upon	10,000	143	340
Trailer Truck Loading LNG Storage Tank Impoundment	Outdoor assembly area occupied by 50 or more people	1,600	287	120
Trailer Truck Loading LNG Storage Tank Impoundment	Offsite structures used for occupancies or residences	3,000	201	120
Trailer Truck Loading LNG Storage Tank Impoundment	Property line that can be built upon	10,000	108	120
LNG Storage Tank Impoundment Sump	Property line that can be built upon	1,600	347	517
Process Area Sump	Property line that can be built upon	1,600	174	393
Trailer Truck Loading Area Sump	Property line that can be built upon	1,600	67	105
^a The 1,600 Btu/ft ² -hr flux level is associated with an exposed person experiencing burns within about 30 seconds. At 3,000 Btu/ft ² -hr, an exposed person would experience burns within 10 seconds; however, a wooden structure would not be expected to burn and affords protection to sheltered persons. At 10,000 Btu/ft ² -hr, clothing and wood can ignite spontaneously and the flux level is considered sufficient to damage steel structures after several minutes of exposure.				
^b Distance from the center of the LNG pool.				

Vapor Dispersion Exclusion Zone

A large quantity of LNG spilled without ignition would form a flammable vapor cloud that would travel with the prevailing wind until it either dispersed below the flammable limits or encountered an ignition source. Part 193.2059 and sections 2.2.3.3 and 2.2.3.4 of NFPA 59A require that provisions be made to minimize the possibility of flammable vapors from reaching a property line that can be built upon and that would result in a distinct hazard. Part 193.2059 requires that dispersion distances be calculated for a 2.5 percent average gas concentration [$\frac{1}{2}$ the lower flammability limit (LFL) of LNG vapor] under meteorological conditions that result in the longest downwind distances at least 90 percent of the time. Alternatively, maximum downwind distances may be estimated for stability Class F (the most stable situation), a wind speed of 4.5 mph, 50 percent relative humidity, and the average regional temperature (these parameters are specified by Part 193.2059). The section allows the use of the Dense Gas Dispersion Model (DEGADIS), or the FEM3A model, to compute dispersion distances. Design spills into impounding areas serving LNG containers, transfer systems, and piping are to be determined in accordance with section 2.2.3.5 of NFPA 59A. For its vapor dispersion analysis, SES selected the following ambient conditions: stability Class F, 4.5 mph wind speed, 50 percent relative humidity, and an average regional temperature of 65.3 °F (obtained from SCAQMD data).

In accordance with section 2.2.3.3 of NFPA 59A, an average concentration of methane in air of 50 percent of the LFL cannot cross the property line that can be built upon from a design spill into each tank impoundment. In this case, compliance with section 2.2.3.3 would also meet the requirements of section 2.2.3.4 of NFPA 59A.

According to table 2.2.3.5 of NFPA 59A, the design spill is the largest flow from the container (i.e., storage tank) withdrawal pumps for a 10-minute duration at full rated capacity. Potential LNG spills occurring from the three storage tank discharge headers and the ship unloading line would be directed to the storage tank impoundment sump. The largest spill from one of the three LNG in-tank pump discharge headers would be 75,000 gallons. The design spill for the marine transfer line was based on the FERC staff's evaluation of all small diameter attachments to the transfer piping for instrumentation, pressure relief, recirculation, etc., which determined that a 3-inch bypass would constitute the single accidental leakage source. Using a 3-inch connection in the marine transfer line, the resulting spill would be 39,600 gallons. Therefore, the design spill for determining the vapor exclusion zone for this sump would be 75,000 gallons.

SES submitted an analysis using a cold vapor to liquid volumetric ratio of 1:235, and calculated that 2,881,100 cubic feet of cold vapor would result from the complete vaporization of a full flow rupture of the ship unloading line spill. SES asserted that because the entire volume of cold vapor would be contained by the 20-foot-high security barrier wall, occupying approximately 39 percent of the 7,392,000-cubic-foot capacity, the vapor dispersion exclusion zone would not extend beyond the terminal property line.

The effects of provisions for containing vapors as a means of mitigating flammable vapor hazards are permitted to be considered in the calculations by NFPA 59A section 2.2.3.3. However, calculations of vapor overflow rates do not account for the mixing of evolved vapor that is likely to occur over extended periods of time. This can be especially problematic for certain sump/impoundment configurations that allow for longer term vapor retention.

As a result, the FERC staff performed a supplementary vapor dispersion analysis for the design spill by conservatively assuming that no 20-foot-high security barrier wall surrounds the LNG storage tanks. SOURCE5 and DEGADIS predict 313 feet to the edge of the $\frac{1}{2}$ LFL concentration envelope. The exclusion zone would not extend off site onto property that can be built upon, if all vapor retention by the security barrier wall surrounding the storage tanks was neglected. This supplementary analysis does not take into account any effects caused by topography, such as the vapor retention effects of the security barrier wall surrounding the storage tanks.

SES also performed vapor dispersion analyses for the process area sump and the trailer truck loading area sump. These sumps would receive spills from the process area and the trailer truck loading area, respectively. In accordance with table 2.2.3.5 of NFPA 59A, the design spill for these sumps would be the flow from any single accidental leakage source for 10 minutes. As previously stated, the determination of the single accidental leakage source should be based on an evaluation of all small diameter attachments to the transfer piping for instrumentation, pressure relief, recirculation, etc., and any flanges that may be used at valves or other equipment, in order to determine the largest spill rate. In its analysis, SES elected to model both the process area and the trailer truck loading area as instantaneous spills from a full pipe rupture and the resulting flow into the sumps as a worst-case scenario.

In calculating vapor dispersion from the process area sump, SES modeled an instantaneous spill from a full pipe rupture and the resulting flow into the sump. SES used a spill size of 95,976 gallons. SOURCE5 and DEGADIS predict 230 feet to the edge of the $\frac{1}{2}$ LFL concentration envelope. This exclusion zone for the process area sump would not extend beyond the terminal property. In calculating vapor dispersion from the trailer truck loading area sump, SES modeled an instantaneous spill of the volume released from three trailer truck loading lines into the sump. SES used a spill size of 8,981 gallons. SOURCE5 and DEGADIS predict the $\frac{1}{2}$ LFL concentration envelope would not be recorded outside of the sump.

The FERC staff performed supplementary vapor dispersion analyses modeled as continuous 10-minute spills from 4-inch- and 3-inch-diameter connections from both the process area and the trailer truck loading area, respectively. In the case of the process area sump, SOURCE 5 and DEGADIS predict 222 feet to the edge of the ½ LFL concentration envelope. This exclusion zone would not extend beyond the terminal property line onto property that can be built upon. In calculating vapor dispersion from the trailer truck loading area sump, SOURCE5 and DEGADIS predict 72 feet to the edge of the ½ LFL concentration envelope. This exclusion zone would not extend beyond the terminal property line. The FERC staff concluded that a spill of the full volume of both the process area and trailer truck loading area sumps would provide the greatest dispersion distances in each case.

4.11.6 Cryogenic Design and Technical Review

As discussed above, study and evaluation of information for the proposed design and installation of the Long Beach LNG import terminal have been performed by the FERC staff. The cryogenic design and technical review emphasizes the engineering design and safety concepts as well as the projected operational reliability of the proposed facilities. The principal areas of coverage include: materials in cryogenic environments; insulation systems; cryogenic safety; thermodynamics; heat transfer; instrumentation; cryogenic processes; and other relevant safety systems.

The design and specifications submitted for the proposed facility to date are considered to be preliminary but would be the basis for any detailed design to follow. A discussion of SES' preliminary plans for hazard detection, hazard control, firewater, emergency shutdown, and security systems is presented in section 2.7.1. A significant amount of the basic design involving final selection of equipment manufacturers, process conditions, and safety-related issues will be completed in the next phase of project development if authorization is granted by the Commission. This information would need to be submitted to the FERC staff for review and approval.

As a result of the technical review of the information provided by SES in the submittal documents, a number of concerns were identified by the FERC staff relating to the reliability, operability, and safety of the facility. In response to staff's questions, SES provided written answers prior to a site visit and cryogenic design and technical review conference for the proposed project that was held in Long Beach in July 2004. Outstanding issues that require resolution are listed below as specific recommendations. Follow up on those items requiring additional action would need to be documented in reports to be filed with the FERC. As a result, **the FERC staff will recommend to its Commission that:**

The following measures shall apply to the LNG terminal design and construction details. Information pertaining to these specific recommendations shall be filed with the Secretary for the review and written approval of the Director of OEP either: prior to initial site preparation; prior to construction of final design; prior to commissioning; or prior to commencement of service as specified in each recommendation below. This information shall be submitted a minimum of 30 days before approval to proceed is required.

- **A complete plan and list of the hazard detection equipment shall be filed prior to initial site preparation. The information shall include a list with the instrument tag number, type and location, alarm locations, and shutdown functions of the proposed hazard detection equipment. Plan drawings shall clearly show the location of all detection equipment.**
- **Prior to initial site preparation, SES shall file a technical review of its facility design that:**

- a. identifies all combustion/ventilation air intake equipment and the distance(s) to any possible hydrocarbon release (LNG, flammable refrigerants, flammable liquids, and flammable gases); and
 - b. demonstrates that these areas would be adequately covered by hazard detection devices and indicates how these devices would isolate or shut down any combustion equipment whose continued operation could add to or sustain an emergency.
- A complete plan and list of the fixed and wheeled dry-chemical, fire extinguishing, and high expansion foam hazard control equipment shall be filed prior to initial site preparation. The information shall include a list with the equipment tag number, type, size, equipment covered, and automatic and manual remote signals initiating discharge of the units. Plan drawings shall clearly show the planned location of all fixed and wheeled extinguishers.
- The final design of the hazard detection equipment shall identify manufacturer and model.
- The final design of the hazard detection equipment shall include redundancy and fault detection and fault alarm monitoring in all potentially hazardous areas and enclosures.
- The final design of the hazard detection equipment shall provide flammable gas and UV/IR hazard detectors with local instrument status indication as an additional safety feature.
- The final design of the fixed and wheeled dry-chemical, fire extinguishing, and high expansion foam hazard control equipment shall identify manufacturer and model.
- The final design shall include equipment and instrumentation for the measurement of translational and rotational movement of the inner vessel for use during and after cool down.
- The final design shall include a minimum of three onsite seismic instruments that would have the capability of actuating an automatic plant-wide ESD in the event of seismic activity approaching the site CLE. SES shall specify the set point to be used.
- In the final design all structures, besides the LNG storage tanks, shall be designed to withstand the effects of an OBE, as required by Title 49 CFR Part 193 and NFPA 59A (2001), and, further, the condition of these structures shall not adversely affect the stability and integrity of the tanks in the SSE event.
- The final design shall include details of the LNG tank tilt settlement and differential settlement limits between each LNG tank and piping and procedures to be implemented in the event that limits are exceeded.
- The final design shall include drawings and specifications of the piping support structure of the LNG storage tanks.

- The final design shall include provisions to ensure that hot water circulation is operable at all times when LNG is present in the secondary LNG booster pump discharge piping or when the temperature in the LNG inlet channel to any vaporizer is below 35 °F.
- The final design shall include detection instrumentation and shutdown procedures for vaporizer tube leak, shell side overpressure, or bursting disc failure.
- The final design shall include provisions to drain the fractionation systems to safe locations.
- The final design shall ensure that air gaps are installed downstream of all seals or isolations installed at the interface between a flammable fluid system and an electrical conduit or wiring system. Each air gap shall vent to a safe location and be equipped with a leak detection device that: would continuously monitor for the presence of a flammable fluid; would alarm the hazardous condition; and would shut down the appropriate systems.
- The final design shall include a fire protection evaluation carried out in accordance with the requirements of NFPA 59A, Chapter 9.1.2.
- The final design shall include details of the shutdown logic, including cause and effect lists for alarm and shut down.
- The final design shall include emergency shutdown of equipment and systems activated by hazard detection devices for flammable gas, fire, cryogenic spills, and earthquake, when applicable.
- The final design shall include procedures for offsite contractors' responsibilities, restrictions, limitations, and supervision of the contractors by SES staff.
- Security personnel requirements prior to and during LNG vessel unloading shall be filed prior to commissioning.
- An operation and maintenance manual and safety procedure manual shall be filed prior to commissioning.
- Copies of the Coast Guard-approved Facility Security Plan and LNG Vessel Operation and Emergency Contingency Plan shall be filed prior to commissioning.
- The contingency plan for failure of the outer LNG tank containment shall be filed prior to commissioning.
- The final detailed drawings of the transfer line impoundment systems, including cross sections, shall be filed prior to commissioning.
- A copy of the criteria for horizontal and rotational movement of the inner vessel for use during and after cool down shall be filed prior to commissioning.
- The FERC staff and Coast Guard shall be notified of any proposed revisions to the security plan and physical security of the facility prior to commencement of service.

- Progress on the construction of the LNG terminal shall be reported in monthly reports filed with the Secretary. Details shall include a summary of activities, problems encountered, and remedial actions taken. Problems of significant magnitude shall be reported to the FERC within 24 hours.

In addition, the FERC staff will recommend to its Commission that the following measures apply throughout the life of the facility:

- The facility shall be subject to regular FERC staff technical reviews and site inspections on at least a biennial basis or more frequently as circumstances indicate. Prior to each FERC staff technical review and site inspection, SES shall respond to a specific data request including information relating to possible design and operating conditions that may have been imposed by other agencies or organizations. Up-to-date detailed piping and instrumentation diagrams reflecting facility modifications and provision of other pertinent information not included in the semi-annual reports described below, including facility events that have taken place since the previously submitted annual report, shall be submitted.
- Semi-annual operational reports shall be filed with the Secretary to identify changes in facility design and operating conditions, abnormal operating experiences, activities (including ship arrivals, quantity and composition of imported LNG, vaporization quantities, boil-off/flash gas, etc.), and plant modifications including future plans and progress thereof. Abnormalities shall include, but not be limited to: unloading/shipping problems, potential hazardous conditions from offsite vessels, storage tank stratification or rollover, geysering, storage tank pressure excursions, cold spots on the storage tanks, storage tank vibrations and/or vibrations in associated cryogenic piping, storage tank settlement, significant equipment or instrumentation malfunctions or failures, non-scheduled maintenance or repair (and reasons therefore), relative movement of storage tank inner vessels, vapor or liquid releases, fires involving natural gas and/or from other sources, negative pressure (vacuum) within a storage tank, and higher than predicted boiloff rates. Adverse weather conditions and the effect on the facility also shall be reported. Reports shall be submitted within 45 days after each period ending June 30 and December 31. In addition to the above items, a section entitled "Significant plant modifications proposed for the next 12 months (dates)" also shall be included in the semi-annual operational reports. Such information would provide the FERC staff with early notice of anticipated future construction/maintenance projects at the LNG facility.
- In the event the temperature of any region of any secondary containment, including imbedded pipe supports, becomes less than the minimum specified operating temperature for the material, the Commission shall be notified within 24 hours and procedures for corrective action shall be specified.
- Significant non-scheduled events, including safety-related incidents (i.e., LNG or natural gas releases, fires, explosions, mechanical failures, unusual over pressurization, and major injuries) and security-related incidents (i.e., attempts to enter site, suspicious activities) shall be reported to the FERC staff and the Coast Guard within 24 hours. In the event an abnormality is of significant magnitude to threaten public or employee safety, cause significant property damage, or interrupt service, notification shall be made immediately, without unduly interfering with any

necessary or appropriate emergency repair, alarm, or other emergency procedure. This notification practice shall be incorporated into the LNG facility's emergency plan. Examples of reportable LNG-related incidents include:

- a. fire;
- b. explosion;
- c. estimated property damage of \$50,000 or more;
- d. death or personal injury resulting in patient hospitalization;
- e. free flow of LNG for 5 minutes or more that results in pooling;
- f. unintended movement or abnormal loading by environmental causes, such as an earthquake, landslide, or flood, that impairs the serviceability, structural integrity, or reliability of an LNG facility that contains, controls, or processes gas or LNG;
- g. any crack or other material defect that impairs the structural integrity or reliability of an LNG facility that contains, controls, or processes gas or LNG;
- h. any malfunction or operating error that causes the pressure of a pipeline or LNG facility that contains or processes gas or LNG to rise above its maximum allowable operating pressure (or working pressure for LNG facilities) plus the build-up allowed for operation of pressure limiting or control devices;
- i. a leak in an LNG facility that contains or processes gas or LNG that constitutes an emergency;
- j. inner tank leakage, ineffective insulation, or frost heave that impairs the structural integrity of an LNG storage tank;
- k. any safety-related condition that could lead to an imminent hazard and cause (either directly or indirectly by remedial action of the operator), for purposes other than abandonment, a 20 percent reduction in operating pressure or shut down of operation of a pipeline or an LNG facility that contains or processes gas or LNG;
- l. safety-related incidents to LNG vessels occurring at or en route to and from the LNG facility; or
- m. an event that is significant in the judgment of the operator and/or management even though it did not meet the above criteria or the guidelines set forth in an LNG facility's incident management plan.

In the event of an incident, the Director of OEP has delegated authority to take whatever steps are necessary to ensure operational reliability and to protect human life, health, property, or the environment, including authority to direct the LNG

facility to cease operations. Following the initial company notification, the FERC staff would determine the need for a separate follow-up report or follow up in the upcoming semi-annual operational report. All company follow-up reports shall include investigation results and recommendations to minimize a reoccurrence of the incident.

4.11.7 Marine Safety⁶

The February 2004 Interagency Agreement provides the framework for the participating agencies to work in a coordinated manner to address the full range of issues regarding safety and security at LNG import terminals. The FERC closely coordinates its pre-certificate review of a proposal with the Coast Guard, which has authority over the safety of LNG vessels and the marine transfer area as well as the security of the LNG vessels and the entire LNG facility.

The hazards associated with the marine transportation of LNG differ from land-based hazards. Whereas the land-based facilities have features to both limit the duration of LNG spills and contain credible spill volumes, any LNG spill on water may be unconfined and may vaporize rapidly due to heat input from the water.

The history of LNG shipping has been free of major incidents, and none has resulted in a significant quantity of cargo being released (see section 4.11.7.3). No incidents have occurred at existing LNG terminals during the 50 years of operation that resulted in any significant quantities of cargo being released. However, the possibility of an LNG spill from a ship over the duration of the proposed project must be considered. Historically, the events most likely to cause a significant release of LNG were a ship casualty such as:

- a vessel colliding with an LNG ship in transit;
- an LNG ship alliding⁷ with the terminal or a structure in the Port;
- a vessel alliding with an LNG ship while moored at the terminal; or
- a grounding sufficiently severe to puncture an LNG cargo tank.

Since the attacks on September 11, 2001, additional risks are considered due to the possibility of a deliberate attack on an LNG ship by a terrorist group.

Any of the above events would have to occur with sufficient impact to breach the LNG ship's double hull and cargo tanks. Previous incidents with LNG ships have primarily involved grounding, and none of these have resulted in the breach of the double hull and subsequent release of LNG cargo.

The following discussion provides a chronology of the LNG ship voyage from the liquefaction facility to the import terminal, disclosing the risks at each step and how they are managed. Details and analysis are provided in subsequent sections. A detailed discussion of LNG ship standards and design features is presented in section 2.1.2.

4.11.7.1 LNG Vessels and Ocean Voyage

Imported LNG could be obtained from exporting terminals throughout the world and delivered by LNG ships to the proposed terminal. Exporting countries include Algeria, Australia, Brunei, Indonesia,

⁶ This section was written with the cooperation and assistance of the Coast Guard, Sector Los Angeles-Long Beach.

⁷ "Allision" is the action of dashing against or striking upon a stationary object (e.g., the running of one ship upon another ship that is docked) - distinguished from "collision," which is used to refer to two moving ships striking one another.

Malaysia, Nigeria, Oman, Qatar, Trinidad, and United Arab Emirates. In 2003, LNG imports to the United States included: 72 percent from Trinidad, 12 percent from Nigeria, 10 percent from Algeria, 3 percent from Qatar, 2 percent from Oman, and 1 percent from Malaysia. SES has indicated that the LNG for the proposed terminal would likely be imported from Pacific suppliers, which include six plants in the Pacific and four plants in the Middle East.

The LNG ships used to import LNG to the United States would be constructed and operated in accordance with the IMO's Code for the Construction and Equipment of Ships Carrying Liquefied Gases in Bulk, the SOLAS, and Title 46 CFR Part 154, which contain the United States safety standards for vessels carrying bulk LNG. Foreign flag LNG ships are required to possess a valid IMO Certificate of Fitness and a Coast Guard Certificate of Compliance.

In 1993, amendments to the IMO's Code for the Construction and Equipment of Ships Carrying Dangerous Chemicals in Bulk require all tankers to have monitoring equipment with an alarm facility that is activated by detection of overpressure or underpressure conditions within a cargo tank. In addition, the cargo tanks are heavily instrumented, with gas detection equipment in the hold and inter-barrier spaces, temperature sensors, and pressure gauges. Fire protection must include the following systems:

- a water spray (deluge) system that covers the accommodation house control room and all main cargo valves;
- a traditional firewater system that provides water to fire monitors on deck and to fire stations found throughout the ship;
- a dry chemical fire extinguishing system for hydrocarbon fires; and
- a system for protecting machinery including the ballast pump room, emergency generators, and compressors.

As a result of the attacks on September 11, 2001, the IMO agreed to new amendments to the 1974 SOLAS addressing port facility and ship security. The International Ship and Port Facility Security Code was adopted in 2003 by the IMO. This code requires both ships and ports to conduct vulnerability assessments and to develop security plans. The purpose of the code is to: prevent and suppress terrorism against ships; improve security aboard ships and ashore; and reduce risk to passengers, crew, and port personnel on board ships and in port areas, for vessels and cargoes. All LNG ships as well as other cargo vessels 300 gross tons and larger and ports servicing those regulated vessels must adhere to these IMO and SOLAS standards. Some of the IMO requirements are as follows:

Ships:

- Ships must develop security plans that address monitoring and controlling access; monitoring the activities of people, cargo, and stores; and ensuring the security and availability of communications;
- Ships must have a Ship Security Officer (SSO);
- Ships must be provided with a ship security alert system. These systems transmit ship-to-shore security alerts to a competent authority designated by the Flag State Administration, which may include the company, identifying the ship, its location, and indicating that the security of the ship is under threat or it has been compromised. For the

west coast, this signal is received by the Coast Guard's Pacific Area Command Center in Alameda, California.

- International port facilities that ships visit must have a security plan, including focused security for areas having direct contact with ships; and
- Ships may have certain equipment onboard to help maintain or enhance the physical security of the ship.

Port facilities:

- The port facility must have a security plan and a FSO; and
- Certain security equipment may be required to maintain or enhance the physical security of the facility.

Both ships and ports must:

- Monitor and control access;
- Monitor the activities of people and cargo;
- Ensure the security and availability of communications; and
- Complete a Declaration of Security that is signed by the FSO and SSO that ensure areas of security that overlap between the ship and facility are adequately addressed.

4.11.7.2 LNG Vessel Transit in the Port of Long Beach

The POLB facilities are largely a manmade port in deep water sheltered by an extensive manmade breakwater approximately 2 nm from the previous natural shoreline. The complex of piers within the POLB has been constructed using low natural islands, by dredging, and by land reclamation. The general arrangement of the POLB is shown on figure 4.7.3-1. Current and future ship traffic levels within the POLB are discussed in section 4.7.3.1.

LNG Vessel Approach and Handling

Table 4.11.7-1 shows the relative dimensions of two of the larger LNG ships that would be used to transport LNG to the proposed LNG terminal: 125,000 to 145,000 cubic meter cargo capacity typical of ships presently in service; and 165,000 cubic meter potential cargo capacity of future ships.

TABLE 4.11.7-1			
Typical LNG Ship Characteristics			
Specifications	Existing Ships		Future Ships
Capacity	125,000 cubic meters	145,000 cubic meters	165,000 cubic meters
Length	950 feet	950 feet	1,000 feet
Beam	145 feet	158 feet	150 feet
Loaded Draft	38 feet	38 feet	40 feet
Hull Depth	82 feet	88 feet	100 feet
Loaded Displacement	95,000 long tons	108,500 long tons (est.)	122,000 long tons

LNG ships would approach from the ocean generally from the northwest passing north of Catalina Island or from the south passing to the east of Catalina Island. From the ocean, LNG ships would gain access to the LNG terminal site via the Queens Gate entrance, which is the opening between the Long Beach breakwater and the Middle breakwater (see figure 4.7.3-1). The marked channel at Queens Gate is about 1,200 feet wide and 76 feet deep and opens onto the enclosed waters of San Pedro Bay. To access Pier T, the LNG ships would travel northwest within the Long Beach Main Channel into the Middle Harbor. The Long Beach Main Channel is 850 feet wide and 75 feet deep. Adjacent to Pier F, the channel depth is 76 feet and the width is 400 feet. Middle Harbor depth is between 56 to 64 feet at the turning area and 1,500 feet wide. The channel bottom is generally flat and sandy. The LNG berth lies on the sheltered western side of Pier T at Berth 126 in the West Basin. There are no bridges or overhead cables over the channels from the Port entrance to Pier T. There is a subsea cable crossing area at the Queens Gate entrance in water depths of about 76 feet and a subsea cable crossing the channel between Pier F and the Navy Mole in 77 feet of water. Isolated rocks at a depth of 60 feet are outside the navigable channel before the Queens Gate entrance. The ends of the breakwaters at the entrance are also rocky. The embankments at Piers J and F and the Naval Mole bounding the channel are made of rock. These areas adjacent to the navigation channel are well marked.

Vessel traffic in the POLB is controlled through a single VTS located at Point Fermin to the west of the ports of Long Beach and Los Angeles. Ships of 300 gross tons or greater are required to report to the VTS and are monitored by radar from a point 25 nm seaward of Point Fermin. The ships report again on arriving at the boundary of the precautionary area that extends 8 nm to the south of the Queens Gate entrance. The movements of ships are monitored and coordinated by the VTS while they are underway in the area of coverage, at designated anchorages, and to the entrances of the ports. The VTS monitors vessel movements on a 24-hour basis.

The pilots within the POLB receive estimated times of arrival from the VTS and board vessels at a position approximately 2 nm south of the Queens Gate entrance. Once on board, the pilots report to the VTS. Typical transit times for inbound movement to a berth are about 1.5 to 3 hours; outbound movements are typically shorter. Once the ships enter and are inward of the Queens Gate, the responsibility for vessel traffic management transfers from the VTS to the Long Beach pilot service. The Long Beach pilot service is managed by Jacobsen Pilots, which is an independent commercial company that provides services to vessels under a contract with the POLB. Jacobson Pilots' control station is on Pier F, approximately 3,000 feet from the LNG terminal location. Jacobsen Pilots monitors traffic within the POLB 24 hours a day using radar systems and closed circuit television. The watchstanders in the pilot station have a clear view from Pier T, through the West Basin, the western inner anchorage, and the entire Long Beach Main Channel to the Queens Gate entrance.

There are 15 pilots working 3 watches with 5 pilots on duty each shift. An average of 20 vessel movements is handled by each shift on a typical day. The pilots' working hours are monitored and limited as a precaution against fatigue. The pilots are professional seafarers drawn from commercial shipping, the towage service, and naval shipping. The entry requirement is command experience and a 3-year training program. At present, 3 trainees augment the 15 full-time pilots.

One or more pilots would board the LNG vessel and direct the ship's transit in the Port and during berthing. During maneuvers, the pilot would be on board and would oversee the navigation and berthing of the ship. The vessel master would be on the bridge monitoring the pilot's commands and would retain overall responsibility for the safe navigation of the LNG ship. The Coast Guard may have a security boarding team onboard during the transit based on the current threat and risk. Other security measures during the transit would be in accordance with the measures determined in the Waterway Suitability Assessment (WSA) (see section 4.11.7.4) and as required by the Coast Guard.

The Coast Guard, VTS, and Jacobsen Pilots would determine the best time to bring the LNG ship to berth based on security concerns, impacts on other vessels, weather conditions, and other factors. Docking, LNG cargo unloading, and undocking would take less than 24 hours in most cases, weather permitting. In addition to Jacobsen Pilots, the Coast Guard would monitor the LNG vessel through the Port and while unloading cargo. The Coast Guard requires all LNG vessels to give 96-hour advance notice of arrival, including the names of crew members for which they can check among national security databases and the past five port calls. In addition, for other LNG import terminals, the Coast Guard has boarded the LNG vessel outside the entrance to conduct an inspection of the ship's safety systems and perform a security sweep. Other requirements are likely to include a security escort to the dock, establishment of a moving security zone around the vessel while en route (see figure 4.11.7-1) and during unloading operations, an inspection of the dock safety systems prior to commencing cargo transfer, and monitoring all operations until the vessel departs. Maintaining security of the dock and vessel would be the responsibility of the facility in cooperation with federal, state, and local partners as described in the Facility Security Plan (see section 4.11.8). In addition, SES is currently working with the Coast Guard to develop a WSA that will determine the appropriate safety and security measures to mitigate risks while the vessel is operating in the VTS area. The WSA is discussed further in section 4.11.7.4.

The Coast Guard has an extensive tug escort requirement. Escort tugs must be on station at the sea buoy before an incoming ship approaches the pilot operations area. The first tug is typically tethered before the ship approaches the entrance, with a second tug standing by. The second tug is then tethered once the ship clears the entrance. There are six contractors supplying tug services in the ports of Long Beach and Los Angeles. The 26-tug fleet includes both conventional tugs and highly maneuverable tractor tugs. One of the tug services, Foss Maritime, is based in the Back Channel less than 1 nm from the LNG terminal location.

It is anticipated that the pilots would normally turn the LNG ships in the West Basin on arrival and berth to the port side of the ship. The benefit of this is that the vessel would be berthed heading outwards and could depart more easily in the event of an emergency.

Weather Conditions

The weather conditions in the POLB are mild and predictable and the conditions that limit ship movements occur infrequently. The wind climate of the Port area is different from and more predictable than that offshore. In the 44-year period of record, winds of gale force have only been experienced within the POLB during the months of March and November and then for only 0.01 percent of the time. Winds of 17 knots or greater may occur about 1 to 2 percent of the time from November through May. The common diurnal wind pattern of the area is for calm and light winds in the mornings and winds of approximately 15 knots in the afternoons, occasionally gusting to 30 knots.

Adverse wave conditions are historically rare, although choppy seas can occur after a front passes. The POLB experiences occasional swell conditions from the south that are noticeable outside the entrance to the Port. Adverse wave conditions rarely occur inside the harbor because of the shelter provided by the outer breakwater and, in the case of Pier T, because of the additional shelter provided by the Navy Mole.

Non-Internet Public

DRAFT ENVIRONMENTAL IMPACT STATEMENT/ENVIRONMENTAL IMPACT REPORT FOR THE LONG BEACH LNG IMPORT PROJECT

Docket No. CP04-58-000, et al.

Page 4-153
Figure 4.11.7-1

Public access for the above information is available only
through the Public Reference Room, or by e-mail at
public.referenceroom@ferc.gov

The mean tidal range is approximately 5.5 feet, although it reaches a maximum of 8 feet several times per year. Data from the pilots indicate little tidal current and circulation current within the POLB under normal circumstances. However, current levels of 1 to 1.5 knots have been recorded at the Queens Gate entrance and outside the breakwater following high rainfall draining from the Los Angeles River flood control channel. The berth and the West Basin are separated from the outfall of the flood control by the Piers E, F, and G complex. Due to the deep water in the Port and the relatively wide channels and entrances, current effects on ship handling are only noticeable when handling very deep draft ships (62 feet) in the Back Channel. In the area of the proposed LNG ship berth the pilots report no effect when handling vessels of 40 feet draft because of the low blockage factor (ratio of the cross sectional area of the channel and the underwater cross sectional area of the ship) (Eagle Lyon Pope, 2004).

Reduced visibility due to fog and haze is a characteristic of the POLB, although it can be very localized. Records of visibility for Los Angeles show that reduced visibility can be experienced in the area during any month and can occur on several days in a month. The duration of reduced visibility is variable. The incidence of visibility of less than 0.5 mile is low, occurring on less than 1 day per month over the 44-year period of record. The closed circuit television system within the POLB is used by the pilots to determine the real extent of fog within the Port.

Guidelines for Ship Traffic

The State of California has established an HSC to develop standards of care for ensuring the safety of vessels transiting both the ports of Los Angeles and Long Beach. The California Oil Spill Prevention and Response Act of 1990 mandated the Los Angeles/Long Beach HSC. The CDFG's Office of Oil Spill Prevention and Response officially appointed the HSC on August 10, 1991.

The California Oil Spill Prevention and Response Act of 1990 required the HSC to review, evaluate, and develop a plan to address sounding checks, anchorage designations, traffic and routings from port construction and dredging projects, procedures for routing vessels during emergencies that impact navigation, communications systems, channel design plans, placement and effectiveness of navigational aids, bridge management requirements, small vessel congestion in shipping channels, determining when tankers must be accompanied by an escort tug(s), and mechanisms to ensure that the provisions of the plan are fully and regularly enforced.

The HSC has implemented a number of guidelines that govern ship movement within the POLB. These measures include: speed restrictions, transit times, pilot oversight, tug escorts, a traffic movement priority, ship spacing, weather restrictions, under keel clearance, Coast Guard or other security escort, and anchorage areas as described below. All shippers in the POLB must adhere to these guidelines.

- ***Speed Restrictions*** – Ships are encouraged to voluntarily restrict their speed to a maximum of 12 knots at 20 nm out from the Port. This speed restriction is monitored by the VTS. In practice, this means that large vessels are under speed management that allows simple control of engine revolutions and hence ship maneuvering in open water. In the precautionary area from the sea buoy inwards and within the POLB the speed restriction is a maximum of 6 knots for ships of 60,000 tons deadweight or over, and 8 knots for ships between 300 and 60,000 tons.
- ***Transit Times*** – Transit times within the POLB are not specifically limited to either day or night because the layout of the Port, navigation aids, and vessel traffic management systems make night restrictions unnecessary. Therefore, ship movements into and out of the POLB are undertaken during both daylight and night hours.

- ***Pilot Oversight*** – As discussed above, one or more pilots from Jacobsen Pilots would board the LNG vessel and direct its transit in the Port and during berthing.
- ***Tug Escorts*** – As also discussed above, the Coast Guard has an extensive tug escort requirement as part of marine safety management. There is a detailed tug force selection matrix used to ensure the correct minimum bollard pull is assigned to ships. Escort tugs must be on station at the sea buoy before an incoming ship approaches the pilot operations area. The first escort tug is typically tethered before the ship approaches the entrance, with the second tug standing by. The second tug is then tethered once the ship is inside the entrance. When ships are outbound, the tugs are typically untethered before the ship clears the Queens Gate, but stand by until the ship is clear of the entrance.
- ***Traffic Movement Priorities*** – A traffic management priority for outbound ships has been established. This is particularly relevant in the main channel where it passes at the cut between the Navy Mole and Pier F where outbound ships are required to clear the Middle Harbor before inbound vessels enter.
- ***Ship Spacing*** – At present, ships moving within the precautionary area and inside the breakwaters of the POLB are required to maintain a minimum separation distance of 0.25 nm (500 yards). This minimum spacing requirement applies to all ships operating within this area of the Port.
- ***Weather Restrictions*** – Ships are not allowed to start moving within or enter the POLB when visibility is less than three times the overall length of the ship. Movement of tankers or deep draft vessels of 45 feet or more is restricted if visibility falls below 0.75 nm. If the visibility falls below 0.5 nm, the pilot and ship's master are required to ensure that it is safe to proceed. Further, when visibility is less than 0.5 nm and ships are moving, one-way traffic management is imposed.

The POLB and the pilots do not publish fixed operational limits for ship handling in windy conditions because each case is subject to operational review, practicality, and tug allocation. However, for large sail-area ships, such as container ships, 20 knots is a typical upper limit for wind speed for movement of these ships within the Port.

- ***Under Keel Clearance*** – The under keel clearance policy in the POLB includes complying with Coast Guard requirements (Title 33 CFR Part 157.455), which in part include discussion between the ship's master and the pilot to specify the water depths required. The static under keel clearance before roll and pitch considerations in the sector between the sea buoy and the Long Beach Main Channel (inside the entrance), at buoy 3, is a minimum of 10 percent of the ship's draft. In the channel, the required under keel clearance from inside the entrance to the berth is a minimum of 1.5 feet for ships of 75,000 tons deadweight and less, and 3 feet for larger ships. At the berth the requirement is that the vessel be afloat. An LNG ship of 145,000 cubic meters would be less than 75,000 tons deadweight and have less than a 40-foot draft. Thus, the required 10 percent (4 feet) and 1.5-foot under keel clearances would be easily attained.
- ***Coast Guard or Other Security Escort*** – For certain ships, the Coast Guard provides an escort boat to enforce a security zone around the ship. In some cases, the Coast Guard may use an escort boat from the local police department or other security source. The security zone has been defined in Title 33 CFR Part 165.1151 as a 500-yard radius around a liquefied hazardous gas ship (inclusive of LNG ships) that is moored or in the

process of mooring within the breakwater, and 1,000 yards ahead and 500 yards on each side and astern of an LNG ship that is underway either within the breakwater or in an area within 3 nm seaward of the federal breakwater. The Coast Guard may escort the LNG ships on a case-by-case basis at the discretion of the Captain of the Port. A security zone of 1,000 yards ahead and 500 yards astern and on each side of an LNG ship on an inward transit is shown on figure 4.11.7-1.

- ***Anchorage Areas*** – Ships are directed to specific anchoring points and are monitored by radar. Large ships proceeding to anchor are required to have tug assistance to ensure the anchor is dropped at the correct location. It is not anticipated that LNG ships would use an anchorage on inbound transits, except in the rare event when reduced visibility would prevent the vessel from proceeding directly to the berth.

The operational controls by the Coast Guard, VTS, and Jacobsen Pilots and the characteristics of the POLB as described above would minimize the possibility of an LNG cargo spill from groundings, collisions, and allisions.

4.11.7.3 LNG Ship Safety

Since 1959, LNG has been transported by ship without a major release of cargo or a major accident involving an LNG ship. Starting in 1971, LNG began arriving at the Distrigas of Massachusetts Corporation (Distrigas) facility in Everett, Massachusetts. To date, more than 450 cargoes, with volumes ranging from 60,000 to 138,000 cubic meters, have been delivered into the Port of Boston without incident. During 2003, a total of 506 billion cubic feet (204 cargoes) of LNG was imported into the United States. For 30 years, LNG shipping operations have been safely conducted in the United States.

The world's LNG ship fleet numbers 151, with an additional 57 ships contracted for delivery by 2006. During the last 40 years, LNG ships have made over 33,000 voyages and safely transported over 2.72 billion cubic meters of LNG. This includes over 1,500 voyages to or from U.S. ports. Currently, all of the ships in the LNG fleet operate under a foreign flag with foreign crews. A foreign flag ship must have a Certificate of Compliance inspection by the Coast Guard to ensure compliance with International safety standards.

History

During the 33,000 voyages that have been completed since the inception of LNG maritime transportation, there have been only 8 significant incidents involving LNG ships, none of which resulted in spills due to rupturing of the cargo tanks. These incidents are described below.

- ***Pollenger*** had an LNG spill onto the steel cover of cargo tank number one during unloading at Everett, Massachusetts in April 1979. The spill caused cracking of the steel plate.
- ***Mostafa Ben Boulaid*** had a check valve fail when unloading at Cove Point, Maryland in April 1979 releasing a small quantity of LNG onto the ship and causing some minor fracture of the deck plating. Activation of the ship's safety systems (i.e., the emergency shutdown system and water spray system), along with the quick response of the crew, kept the incident from propagating, thus minimizing any serious damage.
- ***El Paso Paul Kayser*** grounded on a rock in June 1979 in the Straits of Gibraltar during a loaded voyage from Algeria to the United States. Extensive bottom damage to the ballast

tanks resulted; however, the cargo tanks were not damaged, and no cargo was released. The complete cargo of LNG was subsequently transferred to another LNG ship and delivered to its United States destination.

- **LNG *Libra's*** propeller shaft fractured while the ship was en route to Japan with a full cargo in October 1980. The ship was taken under tow, and the cargo was safely transferred to another LNG ship and delivered to its destination.
- **LNG *Taurus*** grounded in December 1980 near the entrance to Taboata Harbor, Japan. The grounding resulted in extensive bottom damage, but the cargo tanks were not affected. The ship was refloated and the cargo unloaded.
- ***Isabella*** had LNG spill onto its deck due to a cargo tank overflow in June 1985, causing severe cracking of the steelwork. The spill was attributed to a cargo valve failure during the discharge of cargo.
- ***Tellier*** was blown from its docking berth at Skikda, Algeria in February 1989 during severe winds causing damage to the loading arms and the ship and shore piping. The cargo loading had been secured just before the wind struck, but the loading arms had not been drained. Consequently, the LNG remaining in the loading arms spilled onto the deck causing fracture of some plating.
- ***Norman Lady*** was struck by the nuclear submarine *USS Oklahoma City* while the submarine was rising to periscope depth near the Strait of Gibraltar in November 2002. The 87,000 cubic meter LNG tanker, which had just unloaded its cargo at Barcelona, Spain, sustained only minor damage to the outer layer of its double hull and none to its cargo tanks.

There have also been some incidents that involved the release of small quantities of LNG, such as minor leaks from seals and gaskets, some of which required that operations be temporarily stopped in order to rectify the malfunction.

Vessel Construction

In 1980, at the initial peak of LNG import activity in the United States, the Coast Guard published the report, *Liquefied Natural Gas and Liquefied Petroleum Gas – Views and Practices – Policy and Safety*. The report summarized the Coast Guard's extensive research into the safety hazards of LNG and its view that "...the nature of both LNG and LPG presents an acceptable risk for transportation in maritime commerce." This is due to the fact that LNG ships are well constructed, robust vessels designed to withstand low-energy type incidents that are prevalent in harbors and during docking operations. Moreover, safety measures, both in equipment and training, are planned and designed into these LNG ships to prevent or control all types of potential incidents.

The insulation of cargo tanks on LNG carriers is a complex assembly of many layers. The relief valve capacity for cargo tanks is designed to compensate for overpressure caused by fire. The potential that impingement by a cryogenic liquid could cause brittle fracture of the ship's hull was known to the Coast Guard in the mid-1970s when the U.S. regulations for LNG carriers in Title 49 CFR Part 154 were being developed. Accordingly, the regulations require the use of special crack-arresting steel in strategic locations throughout the vessel's hull. LNG carriers used in U.S. waters must also be constructed in accordance with the IMO Code for the Construction and Equipments of Ships Carrying Liquefied Gases in Bulk. This standard requires that the vessel inner hull adjacent to the cargo tanks be protected against

contact from liquid cargo through a combination of proper material selection, adequate insulation, and use of heating systems.

As required by the IMO conventions and design standards, hold spaces and insulation areas on an LNG carrier are equipped with gas detection and low temperature alarms. These devices monitor for leaks of LNG into the insulation between primary and secondary LNG cargo tank barriers. In addition, hazard detection systems are also provided to monitor the hull structure adjacent to the cargo tank, compressor rooms, motor rooms, cargo control rooms, enclosed spaces in the cargo area, specific ventilation hoods and gas ducts, and air locks.

LNG carriers are equipped with a firewater system with the ability to supply at least two jets of water to any part of the deck in the cargo area and parts of the cargo containment and tank covers above-deck. A water spray system is also available for cooling, fire prevention, and crew protection in specific areas. In addition, certain areas of LNG carriers are fitted with dry chemical powder-type extinguishing systems and CO₂ smothering systems for fighting fires.

Unlike many conventional crude oil tankers, all LNG ships used to deliver LNG to the proposed project would have double-hull construction, with the inner and outer hulls separated by about 10 feet. Furthermore, the cargo tanks are normally separated from the inner hull by a layer of insulation approximately 1 foot thick. As a result, many grounding incidents severe enough to cause a cargo spill on a single-bottom oil tanker would be unable to penetrate both inner and outer hulls of an LNG ship. A study by the Federal Power Commission (FPC), which was the predecessor to the FERC, estimated that the double bottom of an LNG ship would be sufficient to prevent cargo tank penetration in about 85 percent of the cases that penetrated a single-bottom oil tanker.

The probability of an LNG ship sustaining cargo tank damage in a collision would depend on several factors – the displacement and construction of both the struck and striking vessels, the velocity of the striking vessel and its angle of impact with the struck vessel, and the location of the point of impact. The previous FPC study estimated the additional protection afforded by the double-hull would be effective in low energy collisions; overall it would prevent cargo tank penetration in about 25 percent of the cases that penetrated a single-hull oil tanker.

In 1995, to assist the Coast Guard in San Juan, Puerto Rico, EcoEléctrica L.P. prepared an analysis of the damage that could result from an oil tanker striking an LNG ship at berth (FERC, 1996). The analysis assumed a 125,000 cubic meters LNG ship and an 82,000 deadweight ton tanker carrying number 6 fuel oil without tug assistance. The analysis determined the minimum striking speed to penetrate the cargo tanks of an LNG ship for a range of potential collision angles. The resulting minimum striking speeds are presented in table 4.11.7-2 for the two principal cargo systems.

TABLE 4.11.7-2		
Minimum Striking Speed to Penetrate LNG Cargo Tanks		
Angle of Impact	Minimum Striking Speed (knots)	
	Spherical Tanks	Membrane Tanks
Greater than 60 degrees	4.5	3.0
45 degrees	6.3	4.0
30 degrees	9.0	6.0
15 degrees	18.0	12.0

For membrane tanks, the critical on-beam striking speed is 3.0 knots, and for spherical tanks, the critical on-beam speed is 4.5 knots. For both containment types, lower angles of impact result in much greater minimum striking speeds to penetrate LNG cargo tanks.

In another study that appeared in the July/August 2002 issue of the “LNG Journal,” the SIGTTO General Manager provided a table showing the critical speed necessary for a 20,000-ton vessel to puncture the outer hull of an LNG carrier is 7.3 knots. For a 93,000-ton ship, the impact speed is 3.2 knots. In neither case does such an impact result in damage to the LNG cargo containment system or the release of LNG.

In December 2004, the DOE released a study by Sandia National Laboratories, *Guidance on Risk Analysis and Safety Implications of a Large Liquefied Natural Gas (LNG) Spill Over Water* (Sandia Report). The Sandia Report included an LNG cargo tank breach analysis using modern finite element modeling and explosive shock physics modeling to estimate a range of breach sizes for credible accidental and intentional LNG spill events. The analysis of accidental events found that groundings, collisions with small vessels, and low speed (less than 7 knots) collisions with large vessels striking at 90 degrees could cause minor ship damage but would not result in a cargo spill. This is due to the protection provided by the double-hull structure, the insulation layer, and the primary cargo tank of an LNG vessel. High speed (12 knots) collisions with large vessels striking at 90 degrees were found to potentially cause cargo tank breach areas of 0.5 to 1.5 square meters.

Hazards

In the event of a collision or allision of sufficient magnitude to rupture an LNG cargo tank, it is likely that sparks or flames would ignite the flammable vapors at the spill site. In a grounding of sufficient magnitude to rupture an LNG cargo tank, the damage would occur under water and the potential for ignition would be less than for collisions or allisions. In this case, an LNG spill would rapidly vaporize on water and form a potentially flammable cloud. If not ignited, the flammable vapor cloud would drift downwind until the effects of dispersion would dilute the vapors below the LFL for methane. The maximum range of potentially flammable vapors (i.e., the distance to the LFL) is a function of the volume of LNG spilled, the rate of the spill, and the prevailing meteorological conditions. If the flammable vapor cloud encountered an ignition source, the cloud would burn back to the spill site.

The final EIS for the Calcasieu LNG Project in Lake Charles, Louisiana (September 1976) analyzed the maximum range of a flammable vapor cloud and hazardous radiation levels from an instantaneous one-tank spill. As was consistent with risk analyses at that time and for nearly 25 years thereafter, the instantaneous spillage of one cargo tank was considered to be the “worst-case” scenario. Physical constraints on maximum vessel speeds and maximum depths of penetration required to rupture one LNG cargo tank render the instantaneous release of more than one cargo tank to be improbable. This is not to imply that the loss of multiple cargo tanks could never occur, but that the extent of the hazard would not exceed that of the instantaneous spillage of one tank.

For an instantaneous one-tank spill with ignition, the final EIS for the Calcasieu LNG Project estimated that a hazardous thermal radiation level of 5,300 Btu/ft²-hr would extend 3,595 feet from the center of the spill. For an instantaneous one-tank spill without ignition, the final EIS for the Yukon Pacific LNG Project (FERC, March 1995) estimated that potentially flammable vapors could travel up to 3.3 miles with a 10 mph wind and typical atmospheric stability.

In October 2001, the use of a one-tank instantaneous release as the worst-case scenario was re-examined by Quest as part of an effort by the DOE to determine the hazards associated with reopening the Distrigas LNG import terminal following the terrorist attacks of September 11, 2001. It was determined

that time-release spills through 1-meter- and 5-meter-diameter holes would more accurately simulate credible worst-case damage scenarios. Maximum flammable vapor cloud and radiation hazards were calculated for the two spill scenarios. For a spill on water with ignition, the maximum distance to a radiant flux level of 1,500 Btu/ft²-hr was estimated to be 1,770 feet. For a spill on water without ignition, a flammable vapor cloud of 2.5 miles was estimated. In November 2003, in response to comments concerning its October 2001 study, Quest clarified that its study only applied to LNG spills resulting from a collision with a large ship in Boston's Outer Harbor where waves would restrict the spreading of LNG on water.

Since the 2001 Quest study, there has been an emergence of studies by various parties to define the worst-case scenario that would result from a deliberate, terrorist attack on an LNG vessel and the subsequent release of cargo. Distances have been estimated to range from 1,770 to 4,200 feet for a thermal radiation level of 1,500 Btu/ft²-hr. Part of the reason for the apparent discrepancies is the lack of large-scale historical incidents and the need to extrapolate small-scale field test data to a worst-case event. This inevitably leads to differing conservative assumptions among the various parties. For example, some models calculate a time-release cargo discharge through 1-meter- or 5-meter-diameter holes, while others assume that the cargo tank empties instantaneously.

As a result, the FERC commissioned a study by ABSG Consulting Inc. (ABSG) to search and review the literature on experimental LNG spills and on consequence methodologies that are applicable to modeling incidents of LNG spills on water. Further, the goal of the study was to identify appropriate methods for estimating flammable vapor and thermal radiation hazard distances for potential LNG vessel cargo releases during transit and while at berth. The resulting study, *Consequence Assessment Methods for Incidents Involving Releases from Liquefied Natural Gas Carriers*, was released for public comment on May 14, 2004. On June 18, 2004, staff's responses to comments on the consequence assessment methods were issued. As discussed in greater detail in staff's responses, various components of the consequence assessment methodologies were revised based on comments received. The revised study provides the methodology for calculating: the rate of release of LNG from a cargo tank penetration for various sized holes; the spreading of an unconfined LNG pool on water for both continuous spills and rapid (nearly instantaneous) releases; the rate of vapor generation from a unconfined spill on water; thermal radiation distances for LNG pool fires on water; and flammable vapor dispersion distances.

A detailed evaluation of the consequences of a terrorist attack on a modern membrane LNG tanker was prepared by Lloyds Register North America for the Weaver's Cove LNG Project and filed under Critical Energy Infrastructure Information (CEII). The study evaluated the consequences of attacks on an LNG ship by missiles and explosives. Finite element analysis was used to evaluate the effect of various sized charges on both the outer and inner hulls. A 1-meter-diameter hole of the inner hull at the waterline was found to be the average most probable worst-case scenario for hazard consequence assessments. This finding is consistent with the attack on the double-hull oil tanker *Limberg* which caused greater than a 5-meter-diameter hole on the outer hull but only minor damage to the inner hull. A failure modes and effects analysis was used to understand internal LNG release characteristics, and a residual strength analysis was used to investigate damage scenarios for a loaded LNG ship.

As described above, the Sandia Report includes an analysis of accidental events that found that groundings and low speed collisions could result in minor ship damage but not a cargo spill; while high speed collisions could cause a 0.5 to 1.5 square meters cargo tank breach area. For intentional scenarios, the size of the cargo tank hole depends on the location of the ship and the source of the threat. Intentional breach areas were estimated to range from 2 to 12 square meters. In most cases, an intentional breaching scenario would not result in a nominal hole of more than 5 to 7 square meters, which is a more appropriate range to use in calculating potential hazards from spills. These hole sizes are equivalent to circular hole diameters of 2.5 and 3 meters.

The Sandia Report also included guidance on risk management for intentional spills, based on the findings that the most significant impacts on public safety and property exist within approximately 500 meters (1,640 feet) of a spill due to thermal hazards from a fire, with lower public health and safety impacts beyond 1,600 meters (5,250 feet). Large, unignited LNG vapor releases were found to be unlikely, but could extend to 2,500 meters (8,200 feet) for a nominal intentional spill.

Cascading damage due to brittle fracture from exposure to cryogenic liquid or fire-induced damage to foam insulation was evaluated and while possible under certain conditions is not likely to involve more than two or three cargo tanks. Cascading events are not expected to increase the overall fire hazard by more than 20 to 30 percent (1,920 to 2,080 meters) (6,300 to 6,825 feet), but would increase the expected fire duration. RPTs are possible for large spills but the effects would be localized near the spill source and should not cause extensive structural damage.

The methodology described in the ABSG study and revised in the FERC staff's responses to comments was used to calculate the thermal radiation and flammable vapor dispersion distances for several holes ranging in diameter from 1 meter to 3.9 meters. Based on the penetration of the largest cargo tank of a 140,000 cubic meter LNG ship, a potential spill of 23,000 cubic meters is estimated for the volume of LNG above the waterline. The estimated pool spread results and thermal radiation hazard distances are identified in table 4.11.7-3. Thermal radiation calculations are based on an ambient temperature of 44 °F (obtained from National Data Buoy Center data), a relative humidity of 41 percent, and a 20 mph wind speed. Using the methodology, the FERC staff estimated distances for a nominal 2.5-meter and 3-meter diameter hole to range from 4,372 to 4,867 feet for a thermal radiation of 1,600 Btu/ft²-hr, the level which is hazardous for persons located outdoors and unprotected, to 3,370 to 3,746 feet for 3,000 Btu/ft²-hr, an acceptable level for wooden structures, and to 1,991 to 2,205 feet for 10,000 Btu/ft²-hr, a level sufficient to damage steel structures after several minutes of exposure.

TABLE 4.11.7-3				
LNG Spills on Water				
LNG Release and Spread				
Hole Diameter	1.0 meter	2.5 meters	3.0 meters	3.9 meters
Hole Area	0.8 square meter	5 square meters	7 square meters	12 square meters
Spill Time	94 minutes	15 minutes	10.5 minutes	6.1 minutes
Pool Fire Calculations				
Maximum Pool Radius	340 feet	816 feet	936 feet	1,103 feet
Fire Duration	94 minutes	15 minutes	10.8 minutes	6.5 minutes
Distance to:				
1,600 Btu/ft ² -hr	2,212 feet	4,372 feet	4,867 feet	5,536 feet
3,000 Btu/ft ² -hr	1,726 feet	3,370 feet	3,746 feet	4,252 feet
10,000 Btu/ft ² -hr	1,051 feet	1,991 feet	2,205 feet	2,492 feet

Vapor dispersion calculations were based on an ambient temperature of 50 °F, 50 percent relative humidity, a 4.5 mph wind speed, and atmospheric stability Class F (the most stable situation). Based on a 1-meter-diameter hole, an unignited release would result in an estimated pool radius of 420 feet. The unignited vapor cloud would extend to 9,030 feet to the LFL and 12,300 feet to ½ the LFL. It is important to identify certain key assumptions of conditions that must exist in order to achieve the maximum vapor cloud distances. First it would be necessary for an event to create a 1-meter-diameter hole by penetrating the outer hull, the inner hull, and cargo containment without ignition. Far more credible is that the event creating a 1-meter-diameter hole would also result in a number of ignition sources that would lead to an LNG pool fire and subsequent thermal radiation hazards. It is also unlikely

that a flammable vapor cloud could achieve its maximum distance over land surfaces without encountering an ignition source, and subsequently burning back to the source. Vapor dispersion for larger holes was not performed since, realistically, the cloud would not even extend to the maximum distance for a 1-meter-diameter hole before encountering an ignition source.

Areas of the Port along the shoreline would be within a potential transient hazard area during the LNG vessel transit, while areas around the terminal would be exposed to a potential hazard while the LNG vessel is at the dock and unloading cargo. The inbound transit through the POLB would pass other Port tenants that would be within 4,372 to 4,867 feet of the ship channel. Assuming an LNG vessel would transit within the Port at 6 knots, the adjacent Port areas would be exposed to a potential transient hazard for an estimated 19 minutes. In addition, a hazard would exist around the berth during part of the 6- to 18-hour period while the LNG vessel is at the berth and unloading cargo. The operational restrictions that would be imposed by the Coast Guard, the HSC, and Jacobsen Pilots on LNG vessel movements through this area, as well as the requirements that the Coast Guard would impose in its operating plan based on the WSA, would minimize the possibility of a hazardous event occurring along the vessel transit.

By focusing on the worst-case intentional breach scenarios for LNG transportation, there is a tendency to dismiss the potential hazards for other fuels and products commonly transported in U.S. waterways. Some of the previously identified studies that calculate long hazard distances for LNG cargo fires also estimate similarly long distances for gasoline, propane, and jet fuel cargo fires (i.e., they conclude that LNG is no more hazardous than other highly flammable cargoes). Also, it should not be assumed that the hazard distances identified are the assured outcome of an LNG vessel accident or attack, given the conservatism in the models and the level of damage required to yield such large scale releases. Further, these estimated worst-case intentional breach scenarios should not be misconstrued as defining an exclusionary zone. Rather they provide guidance in developing the operating restrictions and mitigating strategies for LNG vessel movements in the POLB, as well as in establishing potential impact areas for emergency response and evacuation planning.

In addition to the analysis conducted by the FERC staff, the POLB commissioned a study to identify and analyze additional incident scenarios that would result from a release of LNG or other hydrocarbons in or near SES' proposed LNG import terminal. This study included an evaluation of the worst-case breach scenarios for LNG vessel transit (see section 4.11.10 and Appendix F). The study commissioned by the POLB includes some scenarios that the FERC staff does not consider credible; however, the POLB is subject to different requirements.

4.11.7.4 Requirements for LNG Ship Operations

The arrival, transit, cargo transfer, and departure of LNG ships in the POLB would adhere to the procedures of Operations and Emergency Manuals to be developed by SES in consultation with the Coast Guard Sector Los Angeles-Long Beach and in accordance with Title 33 CFR Part 127. These procedures would be developed to ensure the safety and security of all operations associated with LNG ship transit and unloading. The manuals would contain specific requirements for the LNG ship, pre-arrival notification, transit through the POLB, the waterfront facility, cargo transfer operations, Coast Guard inspection and monitoring activities, and emergency operations. The Coast Guard Sector Los Angeles-Long Beach would monitor each LNG ship in accordance with these manuals.

Some of the anticipated key provisions of the manuals would be the establishment of a moving security zone for all inbound, outbound, and moored LNG ships; and the use of a minimum of two tugs to assist in the POLB and to maneuver the ship into the berth.

The Coast Guard regulations in Title 33 CFR Part 127, apply to the marine transfer area of waterfront facilities between the LNG ship and the last manifold or valve located immediately before a storage tank. Further, Title 33 CFR Part 127 regulates the design, construction, equipment, operations, inspections, maintenance, testing, personnel training, firefighting, and security of LNG waterfront facilities. The safety systems, including communications, emergency shutdown, gas detection, and fire protection must comply with the regulations in Title 33 CFR Part 127. Under Title 33 CFR Part 127.019, SES would be required to submit two copies of its Operations and Emergency Manuals to the Captain of the Port.

Title 33 CFR Part 127 separates cargo transfer operations into three distinct phases: Preliminary Transfer Inspection (section 127.315); Declaration of Inspection (section 127.317); and LNG Transfer (section 127.319). These different sections require specific actions to be completed prior to and during the transfer. Additionally, there are specific actions required in the case of a release of LNG (section 127.321).

In accordance with Title 33 CFR Part 127.007, SES submitted an LOI to the Coast Guard on April 13, 2005, conveying its intention to build an LNG facility at the proposed site. On June 28, 2005, the Coast Guard published a Notice of Intent to conduct a Waterway Suitability Assessment and a Notice of a Public Meeting in the Federal Register stating its intentions to evaluate the LOI and determine the suitability of the waterway for issuance of an LOR. In addition, the Coast Guard held a public meeting on July 11, 2005 and opened a docket to take comments on the concerns relating to the safety and security of the waterway. Upon completion of its review, the Coast Guard would issue an LOR to address the suitability of the POLB for LNG transport with respect to the following items:

- density and character of marine traffic;
- locks, bridges, or other manmade obstructions;
- depth of water;
- tidal range;
- protection from high seas;
- underwater pipes and cables; and
- distance of berthed vessels from the channel.

Due to numerous planned and proposed LNG import terminals at various ports across the United States and the maritime security implications of LNG marine traffic on a port, on June 14, 2005 the Coast Guard issued a *Navigation and Vessel Inspection Circular – Guidance on Assessing the Suitability of a Waterway for Liquefied Natural Gas (LNG) Marine Traffic* (NVIC). The purpose of this NVIC is to provide Coast Guard Captains of the Port/Federal Maritime Security Coordinators, members of the LNG industry, and port stakeholders with guidance on assessing the suitability of a waterway for LNG marine traffic that takes into account conventional navigation safety/waterway management issues contemplated by the existing LOI/LOR process, but in addition, will also take completely into account maritime security implications. The NVIC also provides specific guidance on the timing and scope of the WSA, which will address both safety and security of the port, the LNG terminal, and the LNG ships. Preparation of this guidance was referenced in the Coast Guard's March 18, 2005 *Report to Congress on Liquefied Natural Gas Terminals*.

The WSA process addresses the transportation of LNG from an LNG ship's entrance into U.S. territorial waters through its transit to and from the LNG receiving facility, and includes operations at the vessel/facility interface. In addition, the WSA addresses the navigational safety issues and port security issues introduced by the proposed LNG operations. The Coast Guard's report on the WSA identifies the relevant safety and security issues from the broad viewpoint of impact on the entire port, as well as provides a detailed review of specific points of concern along the LNG ship's proposed transit route. If

the project is approved, the WSA will be reviewed on an annual basis and updated as needed until the facility is placed in service.

To facilitate implementation of the guidelines presented in the NVIC, the FERC staff will continue working with the Coast Guard Sector Los Angeles-Long Beach and determine how the guidance should be followed by SES.

SES is currently working with the Coast Guard and state and local officials to develop a WSA that will determine the appropriate safety and security measures to mitigate the risks while the LNG vessel is operating in the VTS area. This WSA will be conducted by SES and validated and approved by the Captain of the Port. In order to assess the suitability of the waterway for LNG marine traffic as part of its LOR process, the Coast Guard has solicited input from SES, Port stakeholders, law enforcement officials, emergency response officials, and other state and local officials. SES is preparing a Preliminary WSA that will provide an outline of the project's major impacts on the Port and serve to focus the evaluation of the suitability of the waterway for the LNG marine traffic. Afterward, SES will prepare a Follow-on WSA that will take into account the input of the participating agencies and stakeholders. It is imperative that this information be made available for consideration by the decision makers; therefore, **the FERC staff recommends that:**

- **Prior to the issuance of the final EIS, SES shall submit a Preliminary and Follow-on WSA to the Captain of the Port Coast Guard Sector Los Angeles-Long Beach for review and validation and provide a copy to the FERC staff.**

Once the Preliminary WSA is submitted, the Coast Guard NVIC process will be implemented by the Captain of the Port, as appropriate. After review and validation of the Follow-on WSA, the Coast Guard will submit a WSA report to the FERC staff. The findings of this report will be reviewed by the Director of OEP and implemented by SES if the project is approved.

Some commentors have expressed concern that the local community would have to bear some of the cost of ensuring the security of the LNG facility and the LNG vessels while in transit and unloading at the berth. The potential costs will not be known until the specific security needs have been identified, and the responsibilities of federal, state, and local agencies have been established in the Coast Guard's WSA. Subsequent to the Coast Guard's public meeting on July 11, 2005 to take comments on concerns relating to the safety and security of the waterway, SES committed to fund all identified necessary security/emergency management equipment and personnel costs as a result of the project. SES has also committed to preparing a comprehensive plan that identifies the mechanisms for funding all project-specific security/emergency management costs that would be imposed on state and local agencies. In addition, section 311 of the Energy Policy Act of 2005 stipulates that the FERC must require the LNG operator to develop an Emergency Response Plan that includes a Cost-Sharing Plan before any final approval to begin construction. The Cost-Sharing Plan shall include a description of any direct cost reimbursements to any state and local agencies with responsibility for security and safety at the LNG terminal and near vessels that serve the facility. To allow the FERC and the POLB the opportunity to review the plan, **the Agency Staffs recommend that:**

- **Concurrent with the submission of the Follow-on WSA to the FERC staff, SES shall file its comprehensive plan identifying the mechanisms for funding all project-specific security/emergency management costs that would be imposed on state and local agencies with the FERC and the POLB for the review and written approval of the Director of OEP in consultation with the POLB Director of Planning.**

The FERC staff recognizes that the WSA would be prepared well before import operations would commence, and that the Port's overall operation/security situation may change over that time period. New Port activities may commence, infrastructure may be added, or population density may change. Improvements in technology to detect, deter, and defend against intentional acts may also be developed. Therefore, **the FERC staff will recommend to its Commission that the following measure be included as a specific condition of any approval issued by the FERC:**

- **SES shall annually review its WSA for the project, update the assessment to reflect changing conditions, provide the updated assessment to the Captain of the Port Coast Guard Sector Los Angeles-Long Beach for review and validation, and provide a copy to the FERC staff.**

While the LOR would address the suitability of the POLB for LNG ship transportation, it would not constitute a final authority to commence LNG operations. It is anticipated that the Coast Guard would decide on an LOR as soon as possible after the final EIS/EIR for the project is issued, or wait until after the Commission makes an overall public interest determination regarding the proposal. The Coast Guard's recommendation is subject to certain safety and security provisions, as well as SES developing an LNG Vessel Operation and Emergency Contingency Plan. This plan would be reviewed and updated as necessary to address issues specific to the POLB and the proposed LNG terminal. In addition, the Coast Guard currently enforces a security zone under Title 33 CFR Part 165.1151 for the San Pedro Bay area. This security zone would also apply to LNG vessels in transit and while docked. Only personnel or vessels authorized by the Captain of the Port would be permitted in the security zone.

4.11.8 Terrorism and Security Issues

The security requirements for the onshore component of the proposed project are governed by Title 49 CFR Part 193, Subpart J - Security. This subpart includes requirements for conducting security inspections and patrols, liaison with local law enforcement officials, design and construction of protective enclosures, lighting, monitoring, alternative power sources, and warning signs. Requirements for maintaining safety of the marine terminal are in the Coast Guard regulations in Title 33 CFR Part 127. Requirements for maintaining security of the marine terminal are in Title 33 CFR Part 105.

In the aftermath of the terrorist attacks that occurred on September 11, 2001, terrorism has become a very real issue for the facilities under the Commission's jurisdiction. The FERC, like other federal agencies, is faced with a dilemma in how much information can be offered to the public while still providing a significant level of protection to the facility. Consequently, the FERC has removed energy facility design plans and location information from its website to ensure that sensitive information filed under CEII is not readily available (RM02-4-000 and PL02-1-000 issued February 20, 2003).

Since September 11, 2001, the FERC has been involved with other federal agencies in developing a coordinated approach to protecting the energy facilities of the United States. The FERC continues to coordinate with these agencies, specifically with the Coast Guard, to address this issue. The Coast Guard now requires arriving ships to provide a 96-hour advance notice of arrival that includes key information about the vessel and its crew, which allows the Coast Guard to conduct a terrorism risk assessment and put in place appropriate mitigation before the ship reaches the ship channel. In addition, interstate natural gas companies are actively involved with several industry groups to chart how best to address security measures in the current environment. A Security Task Force has been created and is addressing ways to improve pipeline security practices, strengthen communications within the industry and the interface with government, and extend public outreach efforts.

In September 2002, the DOT's OPS issued non-public guidelines to LNG operators that direct them to develop new security procedures for onshore facilities. Operators were required to prepare a security plan within 6 months that responds to the five threat levels defined by the Office of Homeland Security. OPS conducts subsequent on-site reviews of the security procedures.

On October 22, 2003, the Coast Guard issued a series of six final rules that promulgated the maritime security requirements of the Maritime Transportation Security Act of 2002: Implementation of National Maritime Security Initiatives; Area Maritime Security; Vessel Security; Facility Security; Outer Continental Shelf Facility Security; and the Automatic Identification System. The entire series of rulemakings establishes a new subchapter H in Title 33 CFR. In support of the rulemakings, the Coast Guard applied a risk-based decision-making process to comprehensively evaluate the relative risks of various target and attack mode combinations and scenarios for those vessel types and port facilities that pose a risk of a security incident. This approach provides a more realistic estimation of risk than a simple "worst-case outcome" assessment. Risk management principles acknowledge that while risk generally cannot be eliminated, it can be reduced by adjusting operations to lower consequences, threats, or vulnerability, recognizing that it is easier to reduce vulnerabilities by adding security measures.

Terminal owners or operators subject to Title 33 CFR Part 105 are required to submit a Facility Security Assessment and Facility Security Plan to the Coast Guard Captain of the Port for review and approval 60 days prior to operations. Some of the principal owner or operator responsibilities required by the plan include:

- designating a FSO with a general knowledge of current security threats and patterns, risk assessment methodology, and the responsibility for implementing and periodically updating the Facility Security Plan and Assessment and performing an annual audit for the life of the project;
- conducting a Facility Security Assessment to identify site vulnerabilities, possible security threats, consequences of an attack, and facility protective measures;
- developing a Facility Security Plan based on the Facility Security Assessment with procedures for responding to transportation security incidents; notification and coordination with local, state, and federal authorities, preventing unauthorized access; measures and equipment to prevent or deter dangerous substances and devices; and training and evacuation;
- implementing scalable security measures to provide increasing levels of security at increasing MARSEC levels for facility access control, restricted areas, cargo handling, vessel stores and bunkers, and monitoring;
- conducting security exercises at least once each calendar year and drills at least every 3 months; and
- mandatory reporting of all breaches of security and security incidents.

In accordance with Title 33 CFR Part 105, SES would be required to submit its Facility Security Plan to the Captain of the Port at least 60 days prior to commencement of operations.

Security at the facility would be provided by both active and passive systems. The entire site would be surrounded by a protective enclosure (i.e., a fence) with sufficient strength to deter unauthorized access. The enclosure would also be illuminated with not less than 2.2 lux between sunset and sunrise.

Intrusion detection systems and day/night camera coverage would identify unauthorized access. A 20-foot-high concrete security barrier wall would be installed around the LNG storage tanks. However, SES has not indicated that it would hire a separate security staff (in addition to its permanent security staff) to conduct periodic patrols of the plant, screen visitors and contractors, and assist in maintaining security of the marine terminal during cargo unloading. In order to ensure that the responsibilities of SES' security staff would be expanded to enhance overall security, **the Agency Staffs will recommend to their respective Commissions that the following measure be included as a specific condition of any approvals issued by the FERC and the POLB:**

- **SES shall provide a separate 24-hours-per-day security staff and coordinate with the Coast Guard to define the responsibilities of SES' security staff in supplementing other security personnel and in protecting the LNG ships and terminal.**

In accordance with its responsibilities for land-based security under Title 33 CFR Part 105, the Coast Guard may impose additional control measures related to security (e.g., require SES to revise the design of the LNG terminal to include a removable barricade that would block access to the driveway through the security barrier wall).

Increased security awareness has occurred throughout the industry and the nation. President Bush established the Office of Homeland Security with the mission of coordinating the efforts of all executive departments and agencies to detect, prepare for, prevent, protect against, respond to, and recover from terrorist attacks within the United States. The Commission, in cooperation with other federal agencies and industry trade groups, has joined in the efforts to protect the energy infrastructure, including the more than 300,000 miles of interstate natural gas transmission pipeline and associated LNG facilities.

Safety and security are important considerations in any action undertaken by the FERC and the POLB. The attacks of September 11, 2001 have changed the way LNG terminal operators as well as regulators must consider terrorism, both in approving new projects and in operating existing facilities. However, the likelihood of future acts of terrorism or sabotage occurring at the proposed LNG import terminal, or at any of the myriad natural gas pipeline or energy facilities throughout the United States is unpredictable given the disparate motives and abilities of terrorist groups. The continuing need to construct facilities to support the future natural gas pipeline infrastructure is not diminished by the threat of any such unpredictable acts.

4.11.9 Emergency Response and Evacuation Planning

The current status of SES' coordination with local emergency providers to develop procedures to handle potential fire emergencies at the LNG terminal site and on LNG ships is discussed in section 4.6.5.

Prior to commencing service, SES would prepare emergency procedures manuals, as required by Title 49 CFR Part 193.2509, that provide for: responding to controllable emergencies and recognizing an uncontrollable emergency; taking action to minimize harm to the public including the possible need to evacuate the public; and coordination and cooperation with appropriate local officials. Specifically, section 193.2509(b)(3) requires "Coordinating with appropriate local officials in preparation of an emergency evacuation plan..." Typically, the manuals are prepared at the later stages of the construction process and submitted to the FERC as a requirement prior to placing the facility in service.

While the worst-case scenarios evaluated for the onshore facility in sections 4.11.5 and 4.11.10 and for marine spills in sections 4.11.7 and 4.11.10 provide guidance on the maximum extent of potential hazards, they should not be assumed to represent the evacuation zone for every potential incident. As

with any other fuel or hazardous material, the actual severity of the incident would determine what area needs to be evacuated, if any, rather than a worst-case maximum zone. It is anticipated that the emergency evacuation plans would identify evacuation distances based upon increasing severity of events.

While recognizing that preparing emergency procedures typically occurs at the end of the construction phase rather than at the draft EIS/EIR stage, there remain a number of issues concerning the viability of emergency evacuation. Therefore, **the Agency Staffs will recommend to their respective Commissions that the following measure be included as a specific condition of any approvals issued by the FERC and the POLB:**

- **SES shall develop emergency evacuation routes for the areas along the route of the LNG vessel transit in conjunction with the local emergency officials and file the routes with the FERC and the POLB for the review and written approval of the Director of OEP in consultation with the POLB Director of Planning prior to initial site preparation.**

In addition, section 311 of the Energy Policy Act of 2005 stipulates that the FERC must require the LNG operator to develop an Emergency Response Plan in consultation with the Coast Guard and state and local agencies. The FERC must approve the Emergency Response Plan prior to any final approval to begin construction. To satisfy this requirement, **the Agency Staffs will recommend to their respective Commissions that the following measure be included as a specific condition of any approvals issued by the FERC and the POLB:**

- **SES shall develop an Emergency Response Plan (including evacuation) and coordinate procedures with local emergency planning groups, the ports of Long Beach and Los Angeles, fire departments, state and local law enforcement, the Coast Guard, and other appropriate federal agencies. This plan shall include at a minimum:**
 - a. **designated contacts with state and local emergency response agencies;**
 - b. **scalable procedures for the prompt notification of appropriate local officials and emergency response agencies based on the level and severity of potential incidents;**
 - c. **procedures for notifying residents, employees, and recreational users within areas of potential hazard;**
 - d. **locations of permanent sirens and other warning devices; and**
 - e. **an “emergency coordinator” on each LNG vessel to activate sirens and other warning devices.**

The Emergency Response Plan shall be filed with the FERC and the POLB for the review and written approval of the Director of OEP in consultation with the POLB Director of Planning prior to initial site preparation. SES shall notify the FERC and POLB staffs of all planning meetings in advance and shall report progress on the development of its Emergency Response Plan at 3-month intervals.

4.11.10 POLB Hazards Analysis

In accordance with the CCA, the POLB prepared a PMP to implement Chapter 8 of the CCA, which contains findings and policies aimed at maximizing the use of coastal port resources and minimizing environmental impacts. The CCC subsequently found that it was necessary to incorporate safety and protection findings, declarations, and policies into the PMP. The PMP was amended to include an RMP that provides a set of technical guidelines and a structured management approach for minimization of risk as new POLB projects are developed or existing facilities are modified. The RMP requires the following parameters to be evaluated, as appropriate: radiant heat from a tank fire; radiant heat from a dike fire; blast overpressure; and flying debris. An Application Summary Report prepared in accordance with the certified PMP as amended and the CCA is included in this draft EIS/EIR (see section 5.0).

The RMP requires that a “worst-case” evaluation be prepared for all proposed projects that would involve the storage and/or transport of hazardous materials within the POLB. Once the worst case has been determined, appropriate mitigation measures can be factored in. The POLB retained Quest to identify the hazards from worst-case scenarios that may result from an accidental or intentional (e.g., terrorist-induced) release of LNG or other hydrocarbons in or near SES’ proposed LNG import terminal in Long Beach Harbor.

As part of the hazards analysis, Quest was asked to complete the following five tasks:

- identify a range of potential releases that could result in the largest hazardous conditions outside the import terminal site boundary, including the following scenarios;
 - releases from an LNG storage tank caused by earthquake-induced failure, a projectile (e.g., an airplane or missile) striking one or both tanks, an explosive charge detonated adjacent to one of the tanks, or accidental or intentional release from the piping in the process area;
 - releases from an LNG ship at berth caused by a projectile (e.g., an airplane or missile) striking the ship or an explosive charge in a small boat detonated adjacent to the ship; and
 - releases from an LNG ship in transit resulting from a grounding on, or collision with, the outer breakwater or a collision with another vessel outside the breakwater;
- calculate or estimate the probability of each release event above;
- calculate the size of the hazard zones under worst-case conditions for each release event above;
- determine the impact the worst-case release events would have on adjacent industrial facilities; and
- compare the worst-case analysis for the LNG import terminal to other large-scale flammable fuel facilities.

Quest's final report titled *Hazards Analysis of a Proposed LNG Import Terminal in the Port of Long Beach, California* (POLB Quest Study) (Quest, 2005) is provided in Appendix F and summarized below.

4.11.10.1 Selection and Probability of Potential LNG Release Events

Using the detailed methodology described in Appendix F, Quest identified potential accidental and intentional release events involving the LNG terminal and LNG ships. The accidental releases covered a range of events that could occur at an LNG terminal. These accidental releases included a rupture of or release from process equipment at various locations within the LNG terminal, a release from an LNG ship collision with the breakwater or with another ship outside the breakwater, and a release from an earthquake-induced failure of an LNG storage tank. The intentional releases covered a range of possible terrorist-induced releases from the LNG terminal or an LNG ship ranging from localized damage to equipment as a result of a small explosive charge to more sophisticated and logistically challenging operations involving hijacked aircraft or ships. The specific events identified and the estimated probability of occurrence of each event are shown in table 4.11.10-1. A detailed discussion of each event identified and a description of the methodology used to derive the probability of its occurrence are provided in Appendix F.

The POLB staff reviewed each of the release events listed in table 4.11.10-1 using probability definitions developed by the LACFD (see figure 4.11.10-1). As depicted on figure 4.11.10-1, the first step in a release event evaluation is to consider whether a release is physically possible. For releases determined to be physically possible, the next step is to determine whether the release is considered credible. A release is considered credible if it would occur with a frequency greater than 1 in 1 million years; releases with frequencies less than 1 in 1 million years are considered incredible and are not further evaluated. Once an event is determined to be credible, the range of frequency is defined. Events expected to occur more than once per year are defined as frequent, events expected to occur once every 1 to 10 years are defined as periodic, and events expected to occur every 10 to 100 years are defined as occasional. Using the LACFD criteria, an event is considered possible if it could occur once every 100 to 10,000 years. An improbable event is defined by the LACFD as an event that would not occur for 10,000 years or more.

The RMP uses the term "probable" for a possible event and requires that only the worst probable events be assessed; events determined to be improbable are not assessed. Based on the chances of their occurrence, the earthquake-induced failure of an LNG storage tank and all of the terrorist-induced releases are considered improbable. These events and the consequence analysis results for each event are described in detail in Appendix F but are not considered further in the POLB staff's analysis.

Based on the chances of their occurrence, the release events that are considered possible per the LACFD criteria are a release from process equipment within the LNG terminal and a release from an LNG ship following a collision with the breakwater or with another ship outside the breakwater. These events and the consequence analysis results for each event are described in detail in Appendix F and summarized below.

TABLE 4.11.10-1		
Potential LNG Release Events Evaluated and the Probability of Their Occurrence		
Release Event	Estimate of Frequency of Event	Chance of Event
Accidental		
Rupture of or release from process equipment ^a within the LNG terminal, including: Rupture of process equipment – location A Rupture of process equipment – location B Rupture of process equipment – location C Rupture of process equipment – location D Rupture of process equipment – location E Release from process equipment – location F Release from process equipment – location G	~3(10) ⁻³ per year (Historical record of all export and import LNG terminals worldwide.)	3 chances in 1,000 per year (Note: all releases were in export terminals.)
LNG ship collision with the breakwater or with another ship outside the breakwater, including: Release from an LNG ship following a collision with the breakwater – 1 tank fails Release from an LNG ship following a collision with the breakwater – 5 tanks fail Release from an LNG ship following a collision (outside the breakwater) with another ship of sufficient size and speed – 1 tank fails Release from an LNG ship following a collision (outside the breakwater) with another ship of sufficient size and speed – 5 tanks fail	~1(10) ⁻⁵ per port call (Historical record for LNG shipping. No loss of LNG has occurred.)	1 chance in 1,000 per year (Assumes 100 LNG ship deliveries per year.)
Earthquake-induced failure of an LNG storage tank	~5(10) ⁻⁵ per year (Project evaluation of tank design and local conditions.)	5 chances in 100,000 per year
Intentional		
Release from LNG terminal or ship, including: Terrorist-hijacked airplane crashes into one or both LNG storage tanks Terrorist detonates a bomb near an LNG storage tank Terrorist fires a rocket-propelled grenade (RPG) into one or both LNG storage tanks Terrorist-hijacked airplane crashes into an LNG ship Terrorist places a boat bomb beside an LNG ship Terrorist fires a RPG into an LNG ship Terrorist-controlled ship collides with an LNG ship	~7(10) ⁻⁶ per year (Historical record of terrorist activities in the United States.)	7 chances in 1,000,000 per year (Assumes LNG terminal is as valid a "target" as previous terrorist targets.)
^a Details of the process equipment have been removed because this information is considered Critical Energy Infrastructure Information by the FERC.		

4.11.10.2 Consequence Analysis Results for Possible LNG Release Events

The consequences of an LNG release are proportional to the size of the release. The methodology used by Quest to estimate release sizes and the models and assumptions used to quantify the hazard, or hazards, of each release are described in detail in Appendix F. The potential impacts of LNG release events on humans and structures/equipment are summarized below.

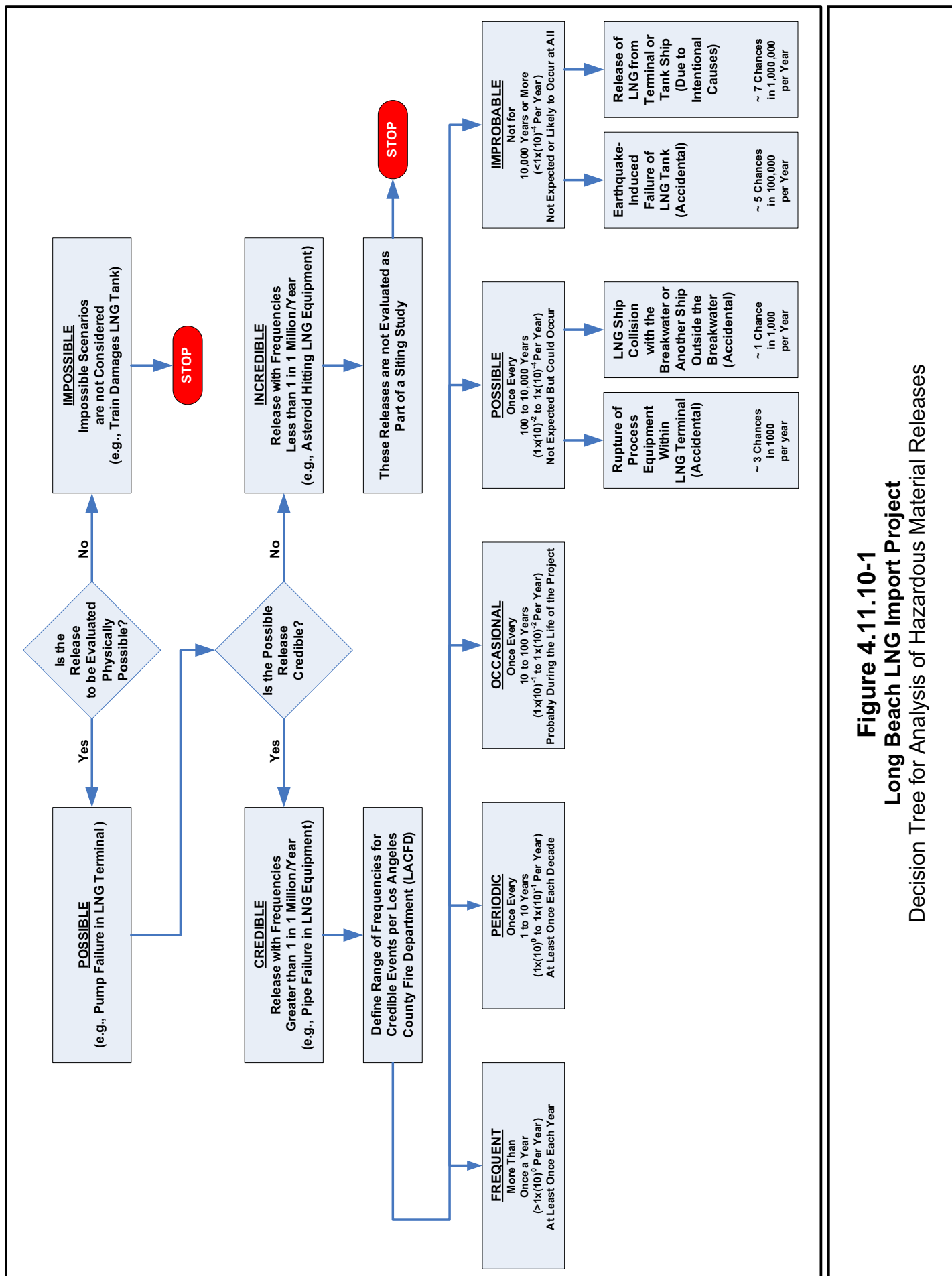


Figure 4.11.10-1
Long Beach LNG Import Project
 Decision Tree for Analysis of Hazardous Material Releases

The consequence analysis performed for the proposed LNG terminal involved the evaluation of a range of refrigerated and superheated liquid releases, as well as releases of ambient temperature and cold natural gas. Each potential release could result in one or more of the following hazards:

- exposure to thermal radiation from a torch fire, which is the result of ignition of a high velocity release of natural gas, LNG, or other hydrocarbons;
- exposure to thermal radiation from a pool fire, which is the result of ignition of a pool of LNG or other hydrocarbons;
- direct contact with flames due to a flash fire, which is the result of delayed ignition of a flammable vapor cloud following a release of natural gas, LNG, or other hydrocarbons; or
- exposure to overpressure, which may be a result of delayed ignition of a flammable vapor cloud created by a release of natural gas, LNG, or other hydrocarbons.

Impact on Humans

The physiological effect of fire on humans depends on the rate at which heat is transferred from the fire to the person, and the time the person is exposed to the fire. Skin that is in contact with flames can be seriously injured even if the duration of the exposure is just a few seconds. Thus, a person wearing normal clothing is likely to receive serious burns to unprotected areas of the skin when directly exposed to the flames from a flash fire (vapor cloud fire).

People in the vicinity of a flash fire, pool fire, or torch fire, but not in contact with the flames, would receive heat from the fire in the form of thermal radiation. Radiant heat flux decreases with increasing distance from the fire, so people close to the fire would receive thermal radiation at a higher rate than people who are farther away. The ability of a fire to cause skin burns due to radiant heating depends on the radiant heat flux to which the skin is exposed, and the duration of the exposure. Thus, short-term exposure to high radiant heat flux levels can be injurious, but if a person is far enough from the fire, the radiant heat flux would be so low that it is incapable of causing injury, regardless of exposure time.

As discussed in section 4.11.5, an incident flux level of 1,600 Btu/ft²-hr is considered hazardous for people located outdoors and unprotected. This flux level is the thermal exclusion zone defined in Title 49 CFR Part 193, through NFPA 59A. In the POLB Quest Study, this thermal exclusion zone is referred to as the radiant vulnerability zone. People located outside this area would not be at risk to the hazard level defined.

Natural gas does not explode unless it is in a confined space at a specific mixture with air and ignited. However, if it does occur, the physiological effects of overpressures depend on the peak overpressure that reaches a person. Exposure to high overpressure levels may be fatal. People located outside the flammable cloud when it ignites would be exposed to lower overpressure levels than people inside the flammable cloud. If the person is far enough from the source of the overpressure, the overpressure is incapable of causing injuries. The hazard level for an explosion overpressure is 1.0 psig. This overpressure could result in injuries to people primarily due to flying debris.

The consequence analysis results for effects on humans from each potential LNG release event listed in table 4.11.10-1 are provided in Appendix F. Appendix F also includes figures depicting the radiant vulnerability zone for each of these release events. The consequence analysis results for the

releases from the LNG terminal and ship operations that are considered possible per the LACFD criteria are presented in table 4.11.10-2. The three largest of these releases (i.e., a release from an LNG ship after a collision with another ship outside the breakwater assuming the failure of five tanks, a release from an LNG ship following a collision with the breakwater assuming the failure of five tanks, and a release from process equipment at location F) are discussed below.

As shown in table 4.11.10-2, the largest radiant vulnerability zone, 3,370 feet, would occur from a release from an LNG ship in transit following a collision with another ship of sufficient size and speed outside the breakwater. Under certain conditions, a collision could have the potential to cause a release of LNG from one or more of the cargo tanks on the LNG ship. For the worst-case scenario, it was assumed that the rate of loss of LNG from one cargo tank compromised the integrity of the inner hull and, over time, led to sequential releases from the remaining LNG cargo tanks. The failures in the subsequent tanks were assumed to be caused by cracking of portions of the inner hull, followed by tears in the membrane tanks. The subsequent failures were assumed to occur in 5-minute intervals. For a membrane tank ship with five cargo tanks, this assumption results in all five tanks releasing cargo within 20 minutes of a collision with another ship. A collision within the breakwater was not considered a credible event by Quest due to the operational controls by the Coast Guard, VTS, and Jacobsen Pilots and the characteristics of the POLB (see section 4.11.7.2).

TABLE 4.11.10-2				
Consequence Analysis Results for the Possible ^a LNG Release Events - Impact on Humans				
Release Event	Distance (ft) to 1,600 Btu/ft ² -hr Radiant Flux Level	Measured From	Distance (ft) to 1 psig Overpressure	Distance (ft) to LFL
Release from a rupture of process equipment – location A	280	Release Point	NA ^b	1,705
Release from a rupture of process equipment – location B	270	Release Point	320	585
Release from a rupture of process equipment – location C	530	Release Point	190	995
Release from a rupture of process equipment – location D	240	Release Point	190	545
Release from a rupture of process equipment – location E	490	Release Point	NA	400
Release from a rupture of process equipment – location F	830	Release Point	320	990
Release from a rupture of process equipment – location G	360	Release Point	320	700
Release from an LNG ship following a collision with the breakwater – 1 tank fails	2,200	Center of LNG Pool by Ship	NA	9,260 (over water)
Release from an LNG ship following a collision with the breakwater – 5 tanks fail	3,345	Center of LNG Pool by Ship	NA	19,330 (over water)
Release from an LNG ship following a collision (outside the breakwater) with another ship of sufficient size and speed - 1 tank fails	2,980	Center of LNG Pool on Water	NA	16,510 (over water)
Release from an LNG ship following a collision (outside the breakwater) with another ship of sufficient size and speed - 5 tanks fail	3,370	Center of LNG Pool on Water	NA	21,200 (over water)
^a As defined by the Los Angeles County Fire Department.				
^b NA = Explosion overpressure level not achieved.				

The radiant vulnerability zone as a result of a release from the LNG ship cargo tanks after a collision with another ship outside the breakwater is depicted on figure 4.11.10-2. This zone is in the ocean approximately 1,400 feet from the nearest land and approximately 9,000 feet from the LNG

terminal site. If ignited, the radiant heat would expose humans within this zone (e.g., recreational boaters) who are outdoors and unprotected to potential injury and death.

The creation of a large flammable cloud without ignition following a release from an LNG cargo tank following collision with another ship outside the breakwater is a credible scenario. The generation of flammable vapor over the open water, with immediate ignition sources limited to the LNG ship itself, results in a scenario where the cloud might drift some distance before encountering an ignition source. Quest calculates the maximum flammable cloud travel distance over water to be 21,200 feet. The cloud would require a little over 100 minutes to travel this distance.

The second largest radiant vulnerability zone, 3,345 feet, would occur from a release from an LNG ship following a collision with the breakwater. If the water depth at the breakwater is sufficient, the LNG ship could strike the breakwater bow first. For the worst-case scenario, it was assumed that the rate of loss of LNG from one cargo tank compromised the integrity of the inner hull and, over time, led to sequential releases from the remaining LNG cargo tanks. The failures in the subsequent tanks were assumed to be caused by cracking of portions of the inner hull, followed by tears in the membrane tanks. The initial tank failure was assumed to occur in the cargo tank nearest the bow of the ship (the point of collision with the breakwater), with the failures progressing toward the stern of the ship. The subsequent failures were assumed to occur in 5-minute intervals. For a membrane tank ship with five cargo tanks, this assumption results in all five tanks releasing cargo within 20 minutes of a collision with the breakwater. Groundings within the breakwater were not considered credible events due to the operational controls by the Coast Guard, VTS, and Jacobsen Pilots and the characteristics of the POLB (see section 4.11.7.2).

The radiant vulnerability zone as a result of a release from the LNG ship cargo tanks after a collision with the breakwater is similar to the radiant vulnerability zone that would occur from a release from an LNG ship following a collision with a ship outside the breakwater and is depicted on figure 4.11.10-2. As discussed above, this zone is in the ocean approximately 1,400 feet from the nearest land and approximately 9,000 feet from the LNG terminal site. If ignited, the radiant heat would expose humans within this zone (e.g., recreational boaters) who are outdoors and unprotected to potential injury and death.

The creation of a large flammable cloud without ignition following a release from an LNG cargo tank following a collision with the breakwater is a credible scenario. The generation of flammable vapor over the open water, with immediate ignition sources limited to the LNG ship itself, results in a scenario where the cloud might drift some distance before encountering an ignition source. Quest calculates the maximum flammable cloud travel distance over water to be 19,330 feet. The cloud would require a little over 90 minutes to travel this distance.

The largest radiant vulnerability zone from a release as a result of a rupture of process equipment, 830 feet, would occur from location F (see figure 4.11.10-3). Quest's analysis assumed a full rupture of the associated piping. If the failure was intentionally caused by an explosive device, the release would be ignited and a torch fire would result. If ignited, the radiant heat would expose humans within this zone who are outdoors and unprotected to potential injury and death. An accidental rupture of the process equipment at location F could cause a release that would not result in ignition. The fluid from the process equipment would be released under pressure and form an aerosol composed of vapor and suspended liquid droplets and virtually none of the liquid would reach the ground. Quest calculates the maximum flammable cloud travel distance for a process equipment release at location F to be 995 feet. A larger flammable cloud travel distance, 1,705 feet, would occur from a process equipment release at location A. As shown in table 4.11.10-2, the largest distance to 1.0 psig explosion overpressure for a process equipment release is 320 feet.

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DRAFT ENVIRONMENTAL IMPACT STATEMENT/ENVIRONMENTAL IMPACT REPORT FOR THE LONG BEACH LNG IMPORT PROJECT

Docket No. CP04-58-000, et al.

Page 4-176
Figure 4.11.10-2

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Docket No. CP04-58-000, et al.

Page 4-177
Figure 4.11.10-3

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Impact on Structures/Equipment

One of the tasks of the POLB Quest Study was to calculate the potential impacts on adjacent industrial facilities, both current and proposed, for the potential accidental and intentional worst-case events. Facilities of particular interest are the existing oil berth at T-121 and the proposed oil berth at T-124. There is also an existing lumber business at T-122. These facilities are shown on figure 4.11.10-4.

Evaluating the impact of radiant and overpressure hazards on industrial equipment located near the LNG terminal requires the use of a different set of radiant flux and explosion overpressure levels than those used to determine impacts on humans. Title 49 CFR Part 193, through NFPA 59A, defines 10,000 Btu/ft²-hr as the limiting heat flux at the demarcation line between land area controlled by the LNG facility and land areas controlled by other parties. The intent is to ensure that the heat flux from code-specified design spill fires would not cause failures of steel-framed buildings and similar industrial-type structures outside the LNG facility. Therefore, when analyzing the effects of worst-case fires that can be much larger than the design spill fires, it is reasonable to use 10,000 Btu/ft²-hr as the lower limit for radiant heat flux calculations in an industrial area. Non-combustible structures outside the 10,000 Btu/ft²-hr zone should not be heavily damaged by the fire, and those within the 10,000 Btu/ft²-hr zone would withstand several minutes of exposure to the radiant heat before failing. Per Title 51 CFR Part 24, exposure to 10,000 Btu/ft²-hr for 15 to 20 minutes would cause wooden buildings to ignite and exposure to 10,000 Btu/ft²-hr for several minutes would damage steel structures. Quest selected a 2.3 psig overpressure as the lower limit for evaluating possible overpressure impacts on the adjacent industrial sites. Overpressures lower than 2.3 psig would not be expected to produce significant damage to industrial equipment.

If portions of T-124 and T-121 were exposed to radiant flux levels in excess of 10,000 Btu/ft²-hr, flammable structures on T-124 and T-121 would be expected to ignite and ordinary storage tanks might incur a roof failure due to metal fatigue. Following a roof failure, the contents in the tank could ignite, resulting in a separate, independent fire source. The storage tanks on T-124 and T-121 are small in comparison with the size of the LNG fire being evaluated. The storage tanks would burn for a longer duration than the LNG fires, but would have significantly smaller impacts on the surroundings. The lumber on T-122 would also be expected to ignite.

The consequence analysis results for effects on structures/equipment from each potential LNG release event listed in table 4.11.10-1 are provided in Appendix F. Appendix F also includes figures depicting the radiant vulnerability zone for each of these release events. The consequence analysis results for the releases from the LNG terminal and ship operations that are considered possible per the LACFD criteria are presented in table 4.11.10-3 and discussed below.

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DRAFT ENVIRONMENTAL IMPACT STATEMENT/ENVIRONMENTAL IMPACT REPORT FOR THE LONG BEACH LNG IMPORT PROJECT

Docket No. CP04-58-000, et al.

Page 4-179
Figure 4.11.10-4

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TABLE 4.11.10-3				
Consequence Analysis Results for the Possible ^a LNG Release Events - Impact on Structures/Equipment				
Release Event	Distance (ft) to 10,000 Btu/ft ² -hr Radiant Flux Level	Measured From	Distance (ft) to 2.3 psig Overpressure	Maximum Overpressure Achieved
Release from a rupture of process equipment – location A	140	Release Point	NA ^b	1.09
Release from a rupture of process equipment – location B	160	Release Point	130	3.06
Release from a rupture of process equipment – location C	360	Release Point	NA	1.86
Release from a rupture of process equipment – location D	160	Release Point	NA	1.86
Release from a rupture of process equipment – location E	400	Release Point	NA	1.09
Release from a rupture of process equipment – location F	600	Release Point	130	3.06
Release from a rupture of process equipment – location G	260	Release Point	130	3.06
Release from an LNG ship following a collision with the breakwater – 1 tank fails	990	Center of LNG Pool by Ship	NA	1.09
Release from an LNG ship following a collision with the breakwater – 5 tanks fail	1,480	Center of LNG Pool by Ship	NA	1.09
Release from an LNG ship following a collision (outside the breakwater) with another ship of sufficient size and speed – 1 tank fails	1,325	Center of LNG Pool on Water	NA	1.09
Release from an LNG ship following a collision (outside the breakwater) with another ship of sufficient size and speed – 5 tanks fail	1,495	Center of LNG Pool on Water	NA	1.09
^a As defined by the Los Angeles County Fire Department.				
^b NA = Explosion overpressure level not achieved.				

As shown in table 4.11.10-3, the largest radiant vulnerability zone, 1,495 feet, would occur from a release from an LNG ship in transit following a collision with another ship of sufficient size and speed outside the breakwater. The second largest radiant vulnerability zone, 1,480 feet, would occur from a release from an LNG ship following a collision with the breakwater. The worst-case scenario for both of these releases assumes a failure of five cargo tanks. The radiant vulnerability zone for these events is depicted on figure 4.11.10-5. This zone is in the ocean approximately 11,000 feet from the LNG terminal site. Therefore, the adjacent industrial facilities would not be impacted by a release from an LNG ship collision with another ship outside the breakwater or from an LNG ship collision with the breakwater.

The largest radiant vulnerability zone from a release as a result of a rupture of process equipment, 600 feet, would occur from location F (see figure 4.11.10-6). Because this zone does not extend to the adjacent industrial facilities, they would not be impacted by a release from a rupture of process equipment at any location.

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Docket No. CP04-58-000, et al.

Page 4-181
Figure 4.11.10-5

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Docket No. CP04-58-000, et al.

Page 4-182
Figure 4.11.10-6

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The majority of the releases identified by Quest resulted in vapor clouds composed primarily of methane, defined as a low reactivity material. Significant overpressures could be generated if natural gas is ignited within a confined space. As shown in table 4.11.10-3, the largest distance to 2.3 psig explosion overpressure is 130 feet. Therefore, none of the vapor cloud explosion events evaluated would result in overpressures high enough to cause a failure of the oil storage tanks proposed for T-124.

4.11.10.3 Mitigation

Release from an LNG Ship Collision with Another Ship or with the Breakwater

Outside the breakwater, there is a precautionary zone in which the speed limit is 12 knots. Ships approaching the POLB must be within the Main Channel, which is outside the breakwater, in order to enter the Outer Harbor. Ships in the Main Channel are restricted to a maximum speed of 10 knots. Within the breakwater, all ships are restricted to a maximum speed of 6 knots. If an LNG tank ship were to be struck by a small ship (e.g., 3,000 deadweight tons) moving at a speed of 6 knots, the small ship would not have sufficient momentum to penetrate the inner and outer hulls of the LNG tank ship. Thus, once inside the breakwater, a ship collision could result in a spill of LNG only if the non-LNG ship involved in the collision is a large ship, and only if the non-LNG ship is moving in a direction nearly perpendicular to the LNG ship when the collision occurs. The limited dimensions of the POLB in the area near the proposed terminal would make it very difficult for a large non-LNG ship to make the maneuvers necessary for it to strike the side of an LNG ship while moving at a speed at or above the critical speed. As discussed above, a collision within the breakwater was not considered a credible event by Quest due to the operational controls by the Coast Guard, VTS, and Jacobsen Pilots and the characteristics of the POLB (see section 4.11.7.2).

A study of the mechanics of LNG ship collisions (Greuner and Böckenbauer, 1980) concluded that if a 125,000 cubic meter LNG ship were to strike a jetty, a dangerous situation would occur only if the ship was moving at a speed of more than 10 knots at the time it hit the jetty. It is expected that LNG ships would be moving at speeds lower than 10 knots when in the vicinity of the breakwater in the POLB.

According to the Los Angeles/Long Beach Harbor Safety Plan (POLB, 2004), the vessel speed limit in the precautionary zone (outside the breakwater but inside the Sierra and Whiskey buoys) is 12 knots. The vessel speed limit in the Main Channel is 10 knots and the vessel speed limit everywhere else in the Port is 6 knots.

The POLB staff will recommend to its Commission that no additional mitigation for a release from an LNG ship collision beyond the measures recommended by the Agency Staffs (see section 4.11.7.4) is feasible.

Release from a Rupture of Process Equipment

There are no residential, visitor-serving, or recreation populations and essentially no exposed Port workers within the 1,600 Btu/ft²-hr radiant vulnerability zone for a release from a rupture of process equipment at any location. Furthermore, the 10,000 Btu/ft²-hr radiant vulnerability zone for a release from a process equipment rupture would not impact the adjacent industrial facilities. Therefore, the POLB staff will recommend to its Commission that no additional mitigation for a release from a rupture of process equipment beyond the measures recommended by the FERC staff (see section 4.11.6) is necessary.

4.11.10.4 Summary

The POLB Quest Study evaluated the extent of fire radiation and explosion overpressure hazards for a range of worst-case releases that included both accidental and intentional releases of flammable fluid from SES' proposed LNG terminal and LNG ship operations in the POLB. The hazards associated with the proposed LNG import terminal and LNG ship operations are common to most flammable fuel facilities worldwide.

The historical record shows that successful intentional releases of flammable fuel from events at facilities in the United States have not occurred. This finding is supported by federal reports addressing this topic that were written after the terrorist events of September 11, 2001. The federal reports do not identify flammable fuel facilities as those that could affect large numbers of the public (Belke, 2000; U.S. Army, 2001; Brookings Institution, 2002; U.S. General Accounting Office, 2003).

A full range of accidental and intentional releases of LNG, natural gas, and other flammable fluids was evaluated. The accidental releases covered a range of events that could occur at an LNG terminal. The intentional releases covered a range of possible terrorist-induced releases ranging from localized damage to equipment as a result of a small explosive charge to more sophisticated and logistically challenging operations involving hijacked aircraft or ships.

The evaluation of the accidental and intentional release scenarios found that the most likely hazard to result from any of the releases is exposure to radiant heat from a pool fire or torch fire. The potential for any of the releases to produce damaging overpressures was found to be small and localized. The potential for drifting flammable vapor clouds to travel a significant distance before being ignited was small, with the possible exception of those releases that may occur outside of the Long Beach Harbor breakwater.

Quest divided the accidental and intentional events that were evaluated into four classes. These classes are defined by the event's historical record, or in the case of an earthquake capable of failing the LNG storage tanks, the predicted frequency of such an earthquake. The four classes are listed in table 4.11.10-1. In general, the historical record of the LNG import/export industry identifies significant failures within the process area to be the most likely event of those evaluated. The second class involves an accidental release from an LNG ship. Although the historical record for LNG tank ships does contain collisions, there has not been a release of LNG during or following a collision. Thus, the probability listed in table 4.11.10-1 assumes that the next shipment of LNG results in a collision and loss of cargo. As LNG shipments continue without incident, this frequency would get smaller.

An earthquake capable of causing a failure of the LNG storage tanks is unrealistic given the chance of occurrence as identified in 4.11.10-1 (5 chances in 100,000). As defined by the LACFD criteria, an earthquake of this magnitude is considered an improbable event.

The final class of release events evaluated by Quest are those associated with intentional acts against the LNG terminal or an LNG ship. These event frequencies are based on the historical record of terrorist events in the United States and are not specific to LNG terminals. This historical record of terrorist-induced events in the United States produces a frequency that is lower than the other event frequencies identified in the POLB Quest Study. As shown in table 4.11.10-1, the chances of a successful terrorist event would be less than seven chances in a million. As defined by the LACFD criteria, all of the terrorist-induced events are considered improbable.

The potential impact on adjacent POLB facilities was evaluated for the worst-case releases in the POLB Quest Study. None of the LNG release events considered possible according to the LACFD criteria would have the potential to impact the adjacent industrial facilities.

Appendix F contains an analysis of the potential hazards associated with accidental and intentional releases from the proposed LNG import terminal in comparison with three other large flammable fuel facilities. Fire radiation impacts (pool fires and torch fires) provided the best method for comparing the impacts among the facilities. When this comparison is made, the maximum radiant impacts from the four facilities range from 595 to 8,610 feet from the fire source. In all four facilities, these worst-case radiant impacts, as defined by 1,600 Btu/ft²-hr radiant heat flux (second degree burns), have the potential to extend past the facility property line.

Additional calculations for a range of LPG storage and transportation vessels in common use in the Long Beach area were made and are presented in Appendix F. The radiant zones were found to range from 20 to over 3,000 feet, dependent on the capacity of the vessel. These potential hazards currently exist in Long Beach on a day-to-day basis.

In the specific case of the proposed LNG import terminal in the POLB, none of the events considered possible according to the LACFD criteria have the potential to produce radiant impacts that could affect the public outside of the industrial area defined by the POLB boundary line. This is true whether the initiating event is accidental or intentional.

It should be noted that the POLB Quest Study is not a full quantitative risk analysis. Thus, not all potential events were identified, quantified, and incorporated into the study. The events evaluated in the study cover a range of the largest accidental and intentionally induced releases that could occur during the LNG terminal and ship operations. The study was not designed to be all inclusive, rather it was targeted at defining a set of representative worst-case impacts. Also, the study does not account for the mitigation strategies currently in place or planned for the proposed project.

It should also be noted that disruption of the terminal, by either natural disaster or terrorism, could cause substantial impact on the local and regional economies, but such effect cannot realistically be analyzed quantitatively. A discussion of the potential economic impact of a closure of the POLB is presented in section 4.6.3.

4.11.11 LNG Truck Safety

4.11.11.1 Proposed LNG Truck Operations

A dual LNG trailer truck loading station is proposed at the Long Beach LNG terminal. A small portion of the LNG from the NGL recovery unit would be sent to the LNG trailer truck loading facility where it would be further processed and recondensed to produce vehicle-fuel-grade LNG. The vehicle grade LNG would be stored in a 3,800 cubic meter (23,901 barrels) storage tank servicing the trailer truck loading facility. The trailer truck LNG storage tank would be similar to the two LNG storage tanks and of full containment design. An average of 16 trucks would be loaded per day for distributing LNG as vehicle fuel throughout Southern California. The nominal loading rate for the LNG is 100 gpm.

The trailer truck LNG loading facilities and storage tank would be field erected, welded, and hydrostatically tested on their foundations. They also would be equipped with multiple safety features. The trailer truck loading area would connect to a trench and spill containment sump system that would be provided in the process area to hold potential LNG spills. A hazard detection system would consist of separate detection units for combustible gas, fire, smoke, and high and low temperature and would be hard wired to the main control system for alarm and emergency shutdown. High expansion foam systems would be provided for the LNG spill containment sump. In addition, hydrants, manual monitors, automatic sweep monitors, and hose reels would be located throughout the LNG terminal

Currently, cargo entering and leaving the POLB does so by using the regional transportation system including Ocean Boulevard, and the Long Beach Freeway (Interstate 710), the Terminal Island Freeway (State Route 47 and State Route 103), and the Harbor Freeway (Interstate 110). These routes would also be utilized by the proposed LNG facility.

4.11.11.2 LNG Truck Operations in California

LNG is currently transported by truck into and throughout California. LNG is trucked into California from plants located in Wyoming, the Pacific Northwest, and Topock, Arizona. Each truckload of LNG totals between 10,000 to 12,000 gallons. Some LNG tanker trucks are equipped with vaporizers, which allow the LNG to be trucked to a site that requires temporary, supplemental natural gas for immediate use. The largest single source of LNG used in California is a plant owned by an affiliate of El Paso Natural Gas Company. This plant, located near Topock, Arizona, supplies California with approximately 29,000 gallons (3 truckloads) per day of LNG.

4.11.11.3 LNG Truck Operations in Northeastern United States

The transportation of LNG by truck began in 1971 from the Distrigas LNG import terminal in Everett, Massachusetts. Approximately 250,000 LNG trucks have been loaded at the facility through the end of calendar year 2001 (see table 4.11.11-1). For the 31-year period, this represents an annual average of 8,056 trucks per year. However, the number of LNG trailer truck loadings can vary significantly from year to year, depending on the severity of the weather and the number of LNG ship cargoes delivered to the Distrigas LNG terminal.

TABLE 4.11.11-1		
LNG Trailer Truck Loadings at the Distrigas LNG Terminal		
Year(s)	Trucks	Max/Year
1971-1979	43,694	
1980-1989	95,027	15,656
1990-1999	83,613	12,885
2000-2001	27,397 ^a	16,813 ^a
Total	249,731	
^a Estimated from MMBtu truck sendout data.		

LNG deliveries by truck have been made to approximately 25 facilities in the northeast, including LNG peak shaving plants, as well as to large and small satellite plants. While the majority of the deliveries are made to facilities in Massachusetts, Rhode Island, and Connecticut, more distant trips are made north to Lewiston, Maine and south to McKee City, New Jersey. The mean distance between Distrigas and the receiving plants is 70 miles.

One of the satellite facilities presently supplied by Distrigas is the KeySpan LNG plant in Providence, Rhode Island, which receives an average of approximately 1,300 LNG truck deliveries per year. Loaded LNG trucks from Everett travel south down Interstate 93 to Interstate 95, exit at Thurber's Avenue, and travel south down Allens Avenue to the KeySpan LNG facility in Providence.

Restrictions on LNG trucking have been imposed by local authorities in some areas and consist of: curfews when children are arriving or leaving school; routing to avoid congested main streets; avoiding certain bridges where a preferred alternative exists; parking restrictions; and prohibition from tunnels.

LNG truck drivers receive 1 week of training specific to LNG operations. A licensed, experienced, newly hired driver receives a 1-day classroom session and 1 day of hands-on truck yard training, followed by 3 days of on-the-road operation with a fully qualified and experienced LNG truck driver as co-pilot. The "Transgas LNG Safety Handbook" serves as the basic instructional material.

LNG Truck Accident History

While the history of LNG trucking has been free of major incidents, the possibility of an LNG truck accident over the duration of the project cannot be dismissed. Unlike conventional gasoline or oil tank trailers, LNG trailers are of a double-shell construction – an inner tank constructed of a cryogenic alloy to contain the LNG, an outer tank of carbon steel, and an evacuated annular space containing perlite insulation. Stiffening rings are incorporated into the outer shell to improve its structural strength and prevent its collapse. A typical 11,000-gallon tanker has a length of 42 feet, an inner tank diameter of 7 feet 4 inches, and an outer tank diameter of 8 feet. LNG trailer design must comply with the requirements of Title 49 CFR Part 173. Drivers must meet the training requirements in Title 49 CFR Part 172.

LNG trucks have a relatively high center of gravity compared to petroleum trucks, due to the low density of LNG and the large tank diameter. This feature increases the truck's susceptibility to over turning accidents in some situations. However, the double-shell construction provides additional damage protection to minimize the potential for a major shell failure and product release.

In 1979, the DOT sponsored a study to quantitatively evaluate the risks associated with the then-current and future levels of LNG trucking from the Distrigas import terminal in Everett. The study was in part a response to an approval by the DOE in 1978 for a three-fold increase of LNG imports at Everett. The final report, *Assessment of Risks and Risk Control Options Associated with Liquefied Natural Gas Trucking Operations from the Distrigas Terminal, Everett, Massachusetts*, was completed by Arthur D. Little, Inc. (A.D. Little) in June 1979.

The study included an evaluation of all known LNG truck accidents in the United States from 1970 through 1977, alternatives to LNG trucking, and risk control options. While the study found the risks associated with the then-current LNG trucking operations were fairly low, it presented a number of options that could reduce risk levels even further. It was estimated that the accident rate per mile could be reduced by 60 percent if these recommendations were followed. In fact, the accident rate has dropped by 80 percent.

Table 4.11.11-2 summarizes LNG truck accidents from 1970 through 1977 and 1978 through 2002. The accident rate of the second period, during which the recommendations in the A.D. Little report were adopted, decreased by approximately 80 percent compared to the first period.

TABLE 4.11.11-2				
LNG Truck Accident Summary				
Years	Number of Accidents	Miles Traveled (millions)	Accidents Per Year	Accidents Per Million Miles
1970-1977	13	26	1.6	0.5
1978-2002	8	81 ^a	0.3	0.1
^a Estimated for 1995 through 2002 based on trucking levels.				

Rollovers, which accounted for 76 percent (16) of the accidents over the 33-year period, are attributed to the relatively high center of gravity. Only four of the accidents resulted in a loss of product

because of the additional damage protection provided by the double-shell construction. Three of these involved relatively minor leaks from fittings or valves that were damaged in the accident. In the only accident involving tank damage, 20 percent of the cargo was spilled. None of the releases resulted in an ignition of vapors and subsequent fire. If an LNG truck accident were to occur along the truck route, the potential hazard would depend on the severity of the accident and whether the cargo tank or associated valves sustained damage. This in turn would determine if the evacuation of nearby residences or businesses was necessary as well as what radius to evacuate. From the historical data, LNG truck accidents have resulted in only minor spills without an LNG fire. According to the 2000 Emergency Response Guide, for a large spill of either LNG or LPG, both widely transported throughout New England, the initial evacuation of 0.5 mile should be considered.

Although the A.D. Little study was prepared in the late 1970s, it is a comprehensive analysis that accurately depicts the LNG trade some 25 years later for several reasons: the LNG trucking levels have remained within the maximum predicted in the report; the LNG truck routes are essentially unchanged other than minor variations to improve safety; the annual mileage has remained within the limits of the study; and the destinations are essentially unchanged (except that five satellite plants in Connecticut have been taken out of service). As a result, the conclusions on the safety of LNG truck transportation remain valid. Further, the 33 years of operation in New England without a public fatality or the ignition of LNG vapors from an LNG truck spill supports the relative safety of this mode of transportation.

4.11.12 Pipeline Facilities

The transportation of natural gas and C₂ by pipeline involves some risk to the public in the event of an accident and subsequent release of gas. The greatest hazard is a fire or explosion following a major pipeline rupture.

Methane, the primary component of natural gas, and C₂ are colorless, odorless, and tasteless. They are not toxic, but are classified as simple asphyxiates, possessing a slight inhalation hazard. If breathed in high concentration, oxygen deficiency can result in serious injury or death.

Methane has an ignition temperature of 1,000 °F and is flammable at concentrations between 5.0 percent and 15.0 percent in air. Unconfined mixtures of methane in air are not explosive. However, a flammable concentration within an enclosed space in the presence of an ignition source can explode. Methane is buoyant at atmospheric temperatures and disperses rapidly in air.

C₂ has an ignition temperature of 950 °F and is flammable at concentrations between 3.0 percent and 16.0 percent in air. C₂ is neutrally buoyant at atmospheric temperatures.

4.11.12.1 Safety Standards

The DOT is mandated to provide pipeline safety under Title 49, USC Chapter 601. The PHMSA, OPS administers the national regulatory program to ensure the safe transportation of natural gas and other hazardous materials by pipeline. It develops safety regulations and other approaches to risk management that ensure safety in the design, construction, testing, operation, maintenance, and emergency response of pipeline facilities. Many of the regulations are written as performance standards that set the level of safety to be attained and allow the pipeline operator to use various technologies to achieve safety. The PHMSA ensures that people and the environment are protected from the risk of pipeline incidents. This work is shared with state agency partners and others at the federal, state, and local level. Section 5(a) of the Natural Gas Pipeline Safety Act provides for a state agency to assume all aspects of the safety program for intrastate facilities by adopting and enforcing the federal standards, while section 5(b) permits a state agency that does not qualify under section 5(a) to perform certain inspection and

monitoring functions. A state may also act as the DOT's agent to inspect interstate facilities within its boundaries; however, the DOT is responsible for enforcement action. The majority of the states have either section 5(a) certifications or section 5(b) agreements, while nine states act as interstate agents.

The DOT pipeline standards are published in Parts 190-199 of Title 49 of the CFR. Part 192 of 49 CFR specifically addresses natural gas pipeline safety issues.

Under a Memorandum of Understanding on Natural Gas Transportation Facilities (Memorandum) dated January 15, 1993 between the DOT and the FERC, the DOT has the exclusive authority to promulgate federal safety standards used in the transportation of natural gas. Section 157.14(a)(9)(vi) of the FERC's regulations require that an applicant certify that it will design, install, inspect, test, construct, operate, replace, and maintain the facility for which a Certificate is requested in accordance with federal safety standards and plans for maintenance and inspection, or shall certify that it has been granted a waiver of the requirements of the safety standards by the DOT in accordance with section 3(e) of the Natural Gas Pipeline Safety Act. The FERC accepts this certification and does not impose additional safety standards other than the DOT standards. If the Commission becomes aware of an existing or potential safety problem, there is a provision in the Memorandum to promptly alert the DOT. The Memorandum also provides for referring complaints and inquiries made by state and local governments and the general public involving safety matters related to pipelines under the Commission's jurisdiction. The FERC also participates as a member of the DOT's Technical Pipeline Safety Standards Committee, which determines if proposed safety regulations are reasonable, feasible, and practicable.

The pipeline and aboveground facilities associated with the Long Beach LNG Import Project would be designed, constructed, operated, and maintained in accordance with the DOT Minimum Federal Safety Standards in Title 49 CFR Part 192. These regulations, which are intended to protect the public and to prevent natural gas facility accidents and failures, include specifications for material selection and qualification; minimum design requirements; and protection of the pipeline from internal, external, and atmospheric corrosion.

The standards in the federal regulations become more stringent as the human population density increases. Part 192 also defines area classifications, based on population density in the vicinity of the pipeline, and specifies more rigorous safety requirements for populated areas. The class location unit is an area that extends 220 yards on either side of the centerline of any continuous 1 mile length of pipeline. The four area classifications are defined as follows:

- Class 1 – Location with 10 or fewer buildings intended for human occupancy.
- Class 2 – Location with more than 10 but less than 46 buildings intended for human occupancy.
- Class 3 – Location with 46 or more buildings intended for human occupancy or where the pipeline lies within 100 yards of any building, or small well-defined outside area occupied by 20 or more people on at least 5 days a week for 10 weeks in any 12-month period.
- Class 4 – Location where buildings with four or more stories aboveground are prevalent.

Class locations representing more populated areas require higher safety factors in pipeline design, testing, and operation. Pipelines constructed on land in Class 1 locations must be installed with a minimum depth of cover of 30 inches in normal soil and 18 inches in consolidated rock. Class 2, 3, and 4 locations, as well as drainage ditches of public roads and railroad crossings, require a minimum cover of

36 inches in normal soil and 24 inches in consolidated rock. All pipelines installed in navigable rivers, streams, and harbors must have a minimum cover of 48 inches in soil or 24 inches in consolidated rock.

Class locations also specify the maximum distance to a sectionalizing block valve (e.g., 10.0 miles in Class 1, 7.5 miles in Class 2, 4.0 miles in Class 3, and 2.5 miles in Class 4). Pipe wall thickness and pipeline design pressures, hydrostatic test pressures, maximum allowable operating pressure, inspection and testing of welds, and frequency of pipeline patrols and leak surveys must also conform to higher standards in more populated areas. SES has stated that it believes its pipelines would be constructed in Class 3 locations. If a subsequent increase in population density adjacent to the right-of-way indicates a change in class location for the pipeline, SES would be required to reduce the MAOP or replace the segment with pipe of sufficient grade and wall thickness to comply with the DOT code of regulations for the new class location.

In 2002, Congress passed an act to strengthen the Nation's pipeline safety laws. The Pipeline Safety Improvement Act of 2002 (HR 3609) was passed by Congress on November 15, 2002, and signed into law by the President in December, 2002. As of December 17, 2004, gas transmission operators were required to develop and follow a written integrity management program that contains all the elements described in Part 192.911 and addresses the risks on each covered transmission pipeline segment. Specifically, the law establishes an integrity management program which applies to all high consequence areas (HCAs). The DOT (68 Federal Register 69778, 69 Federal Register 18228, and 69 Federal Register 29903) defines HCAs as they relate to the different class zones, potential impact circles, or areas containing an identified site as defined in Part 192.903 of the DOT regulations.

The OPS published a series of rules from August 6, 2002 to May 26, 2004 (69 Federal Register 29903), that defines HCAs where a gas pipeline accident could do considerable harm to people and their property and requires an integrity management program to minimize the potential for an accident. This definition satisfies, in part, the Congressional mandate in 49 USC 60109 for the OPS to prescribe standards that establish criteria for identifying each gas pipeline facility in a high-density population area.

The HCAs may be defined in one of two ways. In the first method an HCA includes:

- current Class 3 and 4 locations;
- any area in Class 1 or 2 locations where the potential impact radius⁸ is greater than 660 feet and there are 20 or more buildings intended for human occupancy within the potential impact circle;⁹ or
- any area in Class 1 or 2 locations where the potential impact circle includes an identified site.¹⁰

In the second method an HCA includes any area within a potential impact circle that contains:

- 20 or more buildings intended for human occupancy; or
- an identified site.

⁸ The potential impact radius is calculated as the product of 0.69 and the square root of the maximum allowable operating pressure of the pipeline in psi multiplied by the pipeline diameter in inches.

⁹ The potential impact circle is a circle of radius equal to the potential impact radius.

¹⁰ An identified site is an outside area or open structure that is occupied by 20 or more persons on at least 50 days in any 12-month period; a building that is occupied by 20 or more persons on at least 5 days a week for any 10 weeks in any 12-month period; or a facility that is occupied by persons who are confined, are of impaired mobility, or would be difficult to evacuate.

Once a pipeline operator has determined the HCAs on its pipeline, it must apply the elements of its integrity management program to those segments of the pipeline within HCAs. The DOT regulations specify the requirements for the integrity management plan at Part 192.911. The pipeline integrity management rule for HCAs requires inspection of the entire pipeline in HCAs every 7 years.

Part 192 prescribes the minimum standards for operating and maintaining pipeline facilities, including the requirement to establish a written plan governing these activities. Under Part 192.615, each pipeline operator must also establish an emergency plan that includes procedures to minimize the hazards in a natural gas pipeline emergency. Key elements of the plan include procedures for:

- receiving, identifying, and classifying emergency events, gas leakage, fires, explosions, and natural disasters;
- establishing and maintaining communications with local fire, police, and public officials, and coordinating emergency response;
- emergency shutdown of the system and safe restoration of service;
- making personnel, equipment, tools, and materials available at the scene of an emergency; and
- protecting people first and then property, and making them safe from actual or potential hazards.

Part 192 requires that each operator must establish and maintain liaison with appropriate fire, police, and public officials to learn the resources and responsibilities of each organization that may respond to a natural gas pipeline emergency, and to coordinate mutual assistance. The operator must also establish a continuing education program to enable customers, the public, government officials, and those engaged in excavation activities to recognize a gas pipeline emergency and report it to appropriate public officials. SES would provide the appropriate training to local emergency service personnel before the pipeline is placed in service. No additional specialized local fire protection equipment would be required to handle pipeline emergencies.

4.11.12.2 Pipeline Accident Data

Since February 9, 1970, Title 49 CFR Part 191 has required all operators of transmission and gathering systems to notify the DOT of any reportable incident and to submit a report on form F7100.2 within 20 days. Reportable incidents are defined as any leaks that:

- caused a death or personal injury requiring hospitalization;
- required taking any segment of transmission line out of service;
- resulted in gas ignition;
- caused estimated damage to the property of the operator, or others, or both, of a total of \$5,000 or more;
- required immediate repair on a transmission line;
- occurred while testing with gas or another medium; or

- in the judgment of the operator was significant, even though it did not meet the above criteria.

The DOT changed reporting requirements after June 1984 to reduce the amount of data collected. Since that date, operators must only report incidents that involve property damage of more than \$50,000, injury, death, release of gas, or that are otherwise considered significant by the operator. Table 4.11.12-1 presents a summary of incident data for the 1970 to 1984 period, as well as more recent incident data for 1986 through 2003, recognizing the difference in reporting requirements. The 14.5-year period from 1970 through June 1984, which provides a larger universe of data and more basic report information than subsequent years, has been subject to detailed analysis, as discussed in the following sections.¹¹

TABLE 4.11.12-1		
Natural Gas Service Incidents by Cause		
Cause	Incidents per 1,000 miles of pipeline (percentage)	
	1970-1984	1986-2003
Outside force	0.70 (53.8)	0.10 (38.4)
Corrosion	0.22 (16.9)	0.06 (23.1)
Construction or material defect	0.27 (20.8)	0.04 (15.4)
Other	0.11 (8.5)	0.06 (23.1)
Total	1.30	0.26

During the 14.5-year period, 5,862 service incidents were reported over the more than 300,000 total miles of natural gas transmission and gathering systems nationwide. Service incidents, defined as failures that occur during pipeline operation, have remained fairly constant over this period with no clear upward or downward trend in annual totals. In addition, 2,013 test failures were reported. Correction of test failures removed defects from the pipeline before operation.

Additional insight into the nature of service incidents may be found by examining the primary factors that caused the failures. Table 4.11.12-1 provides a percentage distribution of the causal factors as well as the annual frequency of each factor per 1,000 miles of pipeline in service.

The dominant incident cause is outside forces, constituting 53.8 percent of all service incidents between 1970 and 1984 and 38.4 percent between 1986 and 2003. Outside forces incidents result from the encroachment of mechanical equipment such as bulldozers and backhoes; earth movements due to soil settlement, washouts, or geologic hazards; weather effects such as winds, storms, and thermal strains; and willful damage. Table 4.11.12-2 shows that, of the service incidents caused by outside forces, human error in equipment usage was responsible for approximately 75 percent of the incidents. Since April 1982, operators have been required to participate in "One Call" public utility programs in populated areas to minimize unauthorized excavation activities in the vicinity of pipelines. The "One Call" program is a service used by public utilities and some private sector companies (e.g., oil pipelines and cable television) to provide preconstruction information to contractors or other maintenance workers on the underground location of pipes, cables, and culverts. The 1986 through 2003 data show that the portion of incidents caused by outside forces has decreased to 38.4 percent (see table 4.11.12-1).

¹¹ American Gas Association. 1986. "An Analysis of Reportable Incidents for Natural Gas Transportation and Gathering Lines 1970 Through June 1984." NG-18 Report No. 158, Pipeline Research Committee of the American Gas Association. D.J. Jones, G.S. Kramer, D.N. Gideon, and R.J. Eiber.

TABLE 4.11.12-2 Outside Forces Incidents by Cause (1970-1984)	
Cause	Percent
Equipment operated by outside party	67.1
Equipment operated by or for operator	7.3
Earth movement	13.3
Weather	10.8
Other	1.5

The pipelines included in the data set in table 4.11.12-1 vary widely in terms of age, pipe diameter, and level of corrosion control. Each variable influences the incident frequency that may be expected for a specific segment of pipeline.

The frequency of service incidents is strongly dependent on pipeline age. While pipelines installed since 1950 exhibit a fairly constant level of service incident frequency, pipelines installed before that time have a significantly higher rate, partially due to corrosion. Older pipelines have a higher frequency of corrosion incidents, because corrosion is a time-dependent process. Further, new pipe generally uses more advanced coatings and cathodic protection to reduce corrosion potential.

Older pipelines have a higher frequency of outside forces incidents partly because their location may be less well known and less well marked than newer lines. In addition, the older pipelines contain a disproportionate number of smaller diameter pipelines, which have a greater rate of outside forces incidents. Small diameter pipelines are more easily crushed or broken by mechanical equipment or earth movements.

Table 4.11.12-3 clearly demonstrates the effectiveness of corrosion control in reducing the incidence of failures caused by external corrosion. The use of both an external protective coating and a cathodic protection system, required on all pipelines installed after July 1971, significantly reduces the rate of failure compared to unprotected or partially protected pipe. The data show that bare, cathodically protected pipe actually has a higher corrosion rate than unprotected pipe. This anomaly reflects the retrofitting of cathodic protection to actively corroding spots on pipes.

TABLE 4.11.12-3 External Corrosion by Level of Control (1970-1984)	
Corrosion Control	Incidents per 1,000 miles per year
None-bare pipe	0.42
Cathodic protection only	0.97
Coated only	0.40
Coated and cathodic protection	0.11

4.11.12.3 Impacts on Public Safety

The service incident data summarized in table 4.11.12-1 include pipeline failures of all magnitudes with widely varying consequences. Approximately two-thirds of the incidents were classified as leaks, and the remaining third classified as ruptures, implying a more serious failure.

Table 4.11.12-4 presents the average annual fatalities that occurred on natural gas transmission and gathering lines from 1970 to 2003.

TABLE 4.11.12-4			
Annual Average Fatalities - Natural Gas Transmission and Gathering Systems ^{a, b}			
Year	Employees	Nonemployees	Total
1970-June 1984	2.4	2.6	5.0
1984-2003 ^c	-	-	3.8
1984-2003 ^c	-	-	2.9 ^d
^a 1970 through June 1984 - American Gas Association, 1986. ^b DOT Hazardous Materials Information System. ^c Employee/nonemployee breakdown not available after June 1984. ^d Without 18 offshore fatalities that occurred in 1989 (11 fatalities resulted from a fishing vessel striking an offshore pipeline and 7 fatalities resulted from an explosion on an offshore production platform).			

Fatalities between 1970 and June 1984 have been separated into employees and nonemployees, to better identify a fatality rate experienced by the general public. Of the total 5.0 nationwide average, fatalities among the public averaged 2.6 per year over this period. The simplified reporting requirements in effect after June 1984 do not differentiate between employees and nonemployees. However, the data show that the total annual average for the period 1984 through 2003 decreased to 3.8 fatalities per year. Subtracting two major offshore incidents in 1989, which do not reflect the risk to the onshore public, yields a total annual rate of 2.9 fatalities per year for this period.

The nationwide totals of accidental fatalities from various manmade and natural hazards are listed in table 4.11.12-5 in order to provide a relative measure of the industry-wide safety of natural gas pipelines. Direct comparisons between accident categories should be made cautiously, however, because individual exposures to hazards are not uniform among all categories. Nevertheless, the average 2.6 public fatalities per year is relatively small considering the more than 300,000 miles of transmission and gathering lines in service nationwide. Furthermore, the fatality rate is approximately two orders of magnitude (100 times) lower than the fatalities from natural hazards such as lightning, tornados, floods, earthquakes, etc.

TABLE 4.11.12-5	
Nationwide Accidental Deaths ^a	
Type of Accident	Fatalities
All accidents	90,523
Motor vehicles	43,649
Falls	14,985
Drowning	3,488
Poisoning	9,510
Fires and burns	3,791
Suffocation by ingested object	3,206
Tornado, flood, earthquake, etc. (1984 to 1993 average)	181
All liquid and gas pipelines (1978 to 1987 average) ^b	27
Gas transmission and gathering lines	2.6
Nonemployees only (1970 to 1984 average) ^c	
^a All data, unless otherwise noted, reflect 1996 statistics from the U.S. Department of Commerce, Bureau of the Census, "Statistical Abstract of the United States 118th Edition." ^b U.S. Department of Transportation, "Annual Report on Pipeline Safety - Calendar Year 1987." ^c American Gas Association, 1986.	

The available data show that natural gas pipelines continue to be a safe, reliable means of energy transportation. Based on approximately 306,000 miles in service, the rate of public fatalities for the nationwide mix of transmission and gathering lines in service is 0.01 per year per 1,000 miles of pipeline. Using this rate, the natural gas and C₂ pipelines associated with the Long Beach LNG Import Project might result in a public fatality every 14,493 years. This would not represent a substantial increase in the potential for incidents that would cause serious injury or death to members of the public and, therefore, would not be considered significant.

4.11.13 Conclusions on Safety Issues

Much of the recent safety debate has centered on the perceived size of worst-case scenarios, the distance to various thermal radiation heat levels for LNG fires, the range of potentially flammable vapors, and the population and infrastructure that are located within the various hazard areas. These are components of a consequence analysis.

However, the evaluation of safety is more than an exercise in calculating the consequences of worst-case scenarios. Rather, safety is a determination of the acceptability of risk that considers the probability of events, the effect of mitigation, and the consequences of events.

Accidental Causes

The analysis in the previous sections has shown that based on the extensive operational experience of LNG shipping, the structural design of an LNG vessel, and the operational controls imposed by the ship's master, the Coast Guard, and local pilots, the likelihood of a cargo containment failure and subsequent LNG spill from a vessel casualty – collision, grounding, or allision – is very small. For similar reasons, an accident involving the onshore LNG import terminal or LNG trucking from the terminal is unlikely to affect the public. As a result, the risk to the public from accidental causes should be considered negligible.

Intentional Attacks

Unlike accidental causes, historical experience provides little guidance in estimating the probability of a terrorist attack on an LNG vessel or onshore storage facility. For a new LNG import terminal proposal that would store a large volume of flammable fluid near populated areas, the perceived threat of a terrorist attack is a primary concern of the local population.

However, at the national level, potential terrorist targets are plentiful, including those having national significance, those with a large concentration of the public (e.g., major sporting events, mass transit, skyscrapers, etc.), or critical infrastructure facilities. Currently, the United States has over 500 chemical facilities operating near large populations. U.S. waterways also transport over 100,000 annual shipments of hazardous marine cargo, including LPG, ammonia, and other volatile chemicals. Many of these substances pose similar hazards to those of LNG. The POLB Quest Study reported that the historical probability of a successful terrorist event would be less than seven chances in a million per year. In addition, the multi-tiered security system that would be in place for an LNG import facility in the POLB would reduce the probability of a successful terrorist event.

Risk Management

While the risks associated with the transportation of any hazardous cargo can never be entirely eliminated, they can be managed. For potential targets where the threat is perceived to be high, resources

can be directed to mitigate possible attack paths. Such efforts may deter potential attacks on one target, but shift efforts to those that are less protected. As a result, the issue is how to best direct finite resources.

For the proposed project, it may be possible to apply risk management resources to manage realistic threats; however, an even greater level of resources may be required to manage the threats as perceived at the local level. The issue for the decision makers is whether the resources required to manage the risks are justified by the benefits, while recognizing that the risks cannot be entirely eliminated.

Conclusion

The analysis concludes that none of the potential LNG release scenarios would result in a substantial increase in the potential for incidents that would cause serious injury or death to members of the public. SES' commitment to coordinate with local emergency providers and fund all project-specific security/emergency management costs would ensure that the project would not substantially reduce the level of fire and police services. Therefore, the proposed Long Beach LNG Import Project would not result in a significant impact on public safety.

4.12 CUMULATIVE IMPACTS

Both NEPA and CEQA require lead agencies to consider the cumulative impacts of their actions, including proposed projects that the lead agencies consider for authorization and actions in the region being considered or approved by other agencies. Cumulative impacts may result when the environmental effects associated with an action are superimposed on or added to either temporary or permanent impacts associated with past, present, or reasonably foreseeable future actions. Specifically, NEPA defines cumulative effects as “the impact on the environment which results from the incremental impact of an action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (federal or non-federal) or person undertakes such other actions” (Title 40 CFR Part 1508.7). CEQA defines cumulative impacts as “two or more individual effects that, when considered together, are considerable or that compound or increase other impacts” (Public Resources Code section 15355). Although the individual impact of each separate project might not be significant, the additive effects of multiple actions could be cumulatively considerable (Public Resources Code section 15130).

Existing environmental conditions in the project area reflect changes based on past activities. Historically, the land that is now the City of Long Beach was first settled by Europeans as part of a Spanish Land Grant in 1784. Large-scale real estate development in the City of Long Beach began in the 1880s (City of Long Beach, 2005). In 1911, the POLB was established in 800 acres of mudflats at the mouth of the Los Angeles River. Since then, the Port has expanded to include more than 7,600 acres of wharves, cargo terminals, roadways, rail yards, and shipping channels. Today, the POLB is one of the world’s busiest seaports (POLB, 2005). The highly urbanized environment of the project area reflects the extensive past development that has occurred in the area.

Table 4.12-1 lists the present and reasonably foreseeable future actions (projects or activities) in and near San Pedro Bay that may have a cumulative or additive impact on resources that would be affected by construction of the Long Beach LNG Import Project. Projects and activities included in this analysis are located within the ports of Long Beach and Los Angeles and the City of Long Beach. More distant projects are not assessed because their impact would generally be localized and therefore would not contribute significantly to cumulative impacts in the proposed project area. The geographic scope of the Agency Staffs’ analysis varies depending on the resource being evaluated. The geographic areas are listed below in descending order of size along with the impact topics included in this analysis:

- SCAB – air quality;
- San Pedro Bay – geology, terrestrial biological resources, and marine transportation;
- ports of Long Beach and Los Angeles – soils and sediments, marine biological resources, land use, recreation, visual resources, socioeconomics, land transportation, cultural resources, noise, and reliability and safety; and
- West Basin of the POLB – water resources.

Of the 40 projects identified in table 4.12-1, 17 involve in-water activities (dredging, dike construction, and/or landfilling). The remaining 23 projects involve on-land demolition, grading, filling, paving, and other construction activities. The potential cumulative impacts associated with each resource are discussed below.

TABLE 4.12-1

Existing and/or Proposed Activities Cumulatively Affecting Resources of Concern for the Long Beach LNG Import Project

Location/Project/Activity	Description	Primary Resources Affected			Project Status
		Water Resources	Transportation	Air Quality	
Port of Long Beach					
Gerald Desmond Bridge Replacement Project	Replacement of an existing four-lane bridge with a new six- to eight-lane bridge to accommodate projected increases in vehicular traffic and increased ship sizes.		✓	✓	EIR/EA being prepared
Long Beach LNG Import Project (Proposed Project)	Development of a 25-acre LNG import terminal on a portion of Pier T, designated Berth T-126. Also includes pipeline, electric distribution facilities, and wharf construction.	✓	✓	✓	Subject of this document
Long Beach Naval Complex Disposal and Reuse Project	Development of a container terminal, liquid bulk facility, and satellite launch facility. Includes demolishing the buildings and removing the pavement on the proposed LNG terminal site.	✓	✓	✓	Approved project; development construction underway
Middle Harbor Terminal Redevelopment Project	Consolidation of two existing marine container terminals into one 336-acre terminal.	✓	✓		EIS/EIR being prepared
Pier A West Expansion Project	Expansion of an existing marine container terminal onto an existing oil field including remediation of soil and groundwater.		✓	✓	Conceptual project
Piers G&J Terminal Redevelopment Project	Redevelopment of two existing marine container terminals into one terminal.	✓	✓		Approved project; construction underway
Pier J South Terminal Development Project	Expansion of an existing marine container terminal.	✓	✓	✓	Conceptual project
Pier S Marine Terminal	Development of a 150-acre container terminal and rail yard.	✓	✓	✓	EIS/EIR being prepared
Pier T Liquid Bulk Terminal	Development of a portion of Pier T for an oil import terminal including storage tanks and new unloading docks in the West Basin.	✓	✓	✓	Conceptual project
IR Site 7 Remediation	Remediation of up to 800,000 cubic yards of contaminated sediments in the West Basin.	✓		✓	Proposed project
Port of Los Angeles					
Berths 97 to 109 Container Terminal	Development and operation of a container terminal at Berths 97 to 109 in the West Basin.	✓	✓	✓	EIS/EIR being prepared

TABLE 4.12-1 (cont'd)

Existing and/or Proposed Activities Cumulatively Affecting Resources of Concern for the Long Beach LNG Import Project

Location/Project/Activity	Description	Primary Resources Affected			Project Status
		Water Resources	Transportation	Air Quality	
Berths 136 to 150 Marine Terminal	Reconfiguration of wharves and backland and expansion and redevelopment of the TraPac Terminal. Element of the West Basin Transportation Improvement Program.	✓	✓	✓	Environmental analysis expected to begin fall 2005
Berths 206 to 209 Interim Reuse	Interim reuse of the former Matson Terminal. Change in tenant but no substantial change in operations.				Draft EIR completed
Cabrillo Marine Aquarium Expansion	Expansion of the existing Cabrillo Marine Aquarium.				Approved project; construction underway
Cabrillo Way Marina – Phase II	Redevelopment of old marinas and development of the backlands for commercial and recreational uses.	✓			EIR certified; construction has not begun
Channel Deepening Project	Dredging of up to 8.5 million cubic yards of sediment from the Port of Los Angeles Main Channel.	✓		✓	Approved project; dredging underway
Charter High School and Port Police Headquarters	Development of the “Port of Los Angeles High School of International Business and Maritime Studies” and a Port Police Headquarters campus.				EIR being prepared
Conoco-Phillips Marine Oil Terminal	Lease renewal for a marine oil terminal.				NOP being prepared
Crescent Warehouse Company Relocation	Relocation of the Crescent Warehouse Company’s operations.				Environmental analysis underway; completion expected 2006
East Wilmington Greenbelt Community Center	Construction of a new 10,000-square-foot community building, a 25-space parking lot, and landscaped areas.				Approved project
Evergreen Backlands Improvements Project	Rehabilitation of an existing 125-acre marine terminal.				Approved project
Evergreen Expansion	Expansion of the Evergreen Terminal. Lease boundary changes, gate improvements, wharf modifications, cranes, and new buildings.	✓	✓	✓	NOP being prepared
Fishing Reef	Development of an artificial reef from construction debris south of the San Pedro Breakwater.	✓			Approved project

TABLE 4.12-1 (cont'd)

Existing and/or Proposed Activities Cumulatively Affecting Resources of Concern for the Long Beach LNG Import Project

Location/Project/Activity	Description	Primary Resources Affected			Project Status
		Water Resources	Transportation	Air Quality	
Intermodal Container Transfer Facility	Construction of a new Intermodal Container Transfer Facility.		✓	✓	Proposed project; feasibility of project is currently being investigated
Pacific Corridors Redevelopment Project	Commercial/retail, manufacturing, and residential developments.				Approved project; construction underway
Pacific Energy Systems, Pier 400	Construction of a crude oil receiving facility, tanks, and associated pipelines on Pier 400 of Terminal Island.	✓	✓	✓	NOI/NOP being prepared
Pasha Marine Terminal Improvements	Redevelopment of existing facilities at Berths 171 to 181 as an Omni (multi-use) terminal.				EIR being prepared
Pier 400 Container Terminal and Transportation Corridor Project	Dredging, land filling, and marine terminal construction as part of the 2020 Plan Deep Draft Navigation Improvements.	✓			Approved project; construction underway
San Pedro Waterfront Promenade	Construction of a waterfront promenade walkway along the Main Channel.				EIS/EIR being prepared
SSA Outer Harbor Fruit Facility Relocation	Relocation of an existing fruit import facility at 22 nd and Miner to Berth 153.				NOP being prepared
Ultramar, Valero Lease Renewal	Lease renewal for a liquid bulk (petroleum) terminal.				NOP being prepared
Waterfront Gateway	Development of a waterfront promenade.				Negative Declaration issued
Wilmington Parkway	Realignment and widening of Harry S. Bridges Boulevard including acquisition of properties, expansion of terminal backlands, and construction of associated recreational facilities.		✓	✓	EIS/EIR being prepared
City of Long Beach					
D'Orsay Hotel Project	Development of a hotel.				Approved project; construction pending
Downtown Mall Redevelopment	Development of commercial and residential space.				Approved project; construction underway
Marriott Hotel Project	Development of a hotel.				Approved project; construction pending

TABLE 4.12-1 (cont'd)

Existing and/or Proposed Activities Cumulatively Affecting Resources of Concern for the Long Beach LNG Import Project

Location/Project/Activity	Description	Primary Resources Affected			Project Status
		Water Resources	Transportation	Air Quality	
Pike Property Development	Development of residential units and an office building or hotel.				Approved project; construction underway
The Pike at Rainbow Harbor (formerly Queensway Bay Master Plan)	Construction of Long Beach Aquarium, new urban harbor, office building, and entertainment complex.				Approved project; construction underway
Alameda Corridor Transportation Authority/California Department of Transportation					
Heim Bridge Replacement	Replacement of the seismically deficient Heim Bridge.	✓	✓		Proposed project
State Route 47 Truck Expressway	Improvement of the State Route 47 Expressway.		✓		Proposed project

4.12.1 Geology

Several of the projects listed in table 4.12-1 would affect geological resources in the San Pedro Bay area through the creation of up to 508 acres of new land for marine terminals. The new land would alter the geomorphology of the bay. A century of port development has already created several thousand acres of similar artificial land that overlies natural formations. The additional land created by these projects would only incrementally add to the existing artificial formations in the area and would not be significant. The remaining projects, including the proposed project, would redevelop existing land and would not materially alter the geologic conditions of the area or worsen existing unfavorable geologic conditions. As a result, these projects would represent an insignificant cumulative impact on geological resources.

The creation of additional land associated with the marine terminal projects and installation of the proposed LNG storage tanks on top of previously placed fill materials would create conditions that would be more susceptible to seismic hazards than natural formations because the fill materials consist of hydraulically placed fine sand and silt. This risk is inherent in the construction of such fills in a seismically active area such as southern California and would be addressed in the design process for each project. Each project would be constructed and operated in accordance with all applicable codes and regulations to minimize impacts associated with seismic hazards. A description of the design options for the proposed project is presented in section 4.1.4.3.

4.12.2 Soils and Sediments

Construction of the on-land portions of the projects identified in table 4.12-1 would expose fill materials and/or native soils to the effects of wind, rain, and runoff, which could cause erosion and sedimentation in the area. These effects would be temporary, limited primarily to the period of construction, and highly localized. Cumulative impacts on soils would only occur if other projects are constructed at the same place and time as the proposed project facilities. The demolition of buildings and the removal of pavement associated with the Long Beach Naval Complex Disposal and Reuse Project would be the only other project that would occur at the same place as the proposed project. These activities would be completed before SES' initiation of activities associated with the Long Beach LNG Import Project. In addition, all of the projects would be required to implement appropriate erosion control measures. As a result, no cumulative impacts on soils are anticipated. Disturbance of the sediments in Long Beach or Los Angeles Harbors during in-water activities would temporarily resuspend sediments in the water column, which could result in localized increases in turbidity. An increase in sediment and turbidity levels could have a cumulative impact on water quality and aquatic organisms (see sections 4.12.3 and 4.12.4, respectively).

4.12.3 Water Resources

Seventeen of the projects identified in table 4.12-1, including the proposed project, would involve in-water activities (dredging, dike construction, and/or land filling). Land filling would result in the creation of up to 508 acres of new land. The creation of new land would alter the configuration of the harbors in San Pedro Bay, which could alter water circulation. The filling activities associated with most of these projects would involve inner harbor or small shoreline fills that would not affect large-scale harbor circulation. However, some projects may have localized impacts on circulation within specific basins because they fill dead-end slips and generally decrease the amount of water area in those basins.

Construction of the Long Beach LNG Import Project would occur over a 48-month period. Construction of the other projects identified in table 4.12-1 would occur over approximately 20 years. During construction of these projects, there is an increased potential for turbidity, resuspension of

contaminated sediments, and storm water runoff. In recent years, construction-generated runoff and turbidity have been subjected to increasingly stringent and effective controls. Because of those controls and the monitoring that would be employed during construction of each project, in no individual case for which environmental review has been completed is the impact considered significant. Cumulatively, construction of the projects could have a minor adverse impact on water quality in San Pedro Bay. The impact is not expected to be significant, however, because of the effectiveness of construction controls [e.g., compliance with the requirements of the RWQCB's WDR permit, the ACOE's section 404 permit, and the CSWRCB's NPDES General Permit for Storm Water Discharges Associated with Construction Activity (see section 4.3.3.2)] and the temporal and spatial separation of the individual projects.

Operational impacts on water quality attributable to cumulative development in the San Pedro Bay area could occur as a result of storm water runoff. Runoff is subject to stringent controls and BMPs as required by the general industrial NPDES permit program and the applicable municipal storm water permits administered by the Cities of Los Angeles and Long Beach. Implementation of the BMPs would reduce the cumulative impacts associated with the projects identified in table 4.12-1 to less than significant levels.

Dredging activities would remove contaminated sediments for appropriate disposal. This could minimize the total amount of contaminated sediments in contact with the marine environment. Dredging permits for all of the projects would include measures to prevent significant resuspension of contaminants into the water column and ensure that sediments are handled and disposed of properly (e.g., monitoring and reporting programs to ensure that significant levels of contaminants would not be released to the harbor waters or adversely affect beneficial uses of the harbor). Because all of the projects would be subject to strict operational controls (e.g., specifications for the storage of fuel and other hazardous liquids; requirements for inspection of equipment for leaks and deterioration; and notification, response, and cleanup procedures in the event of a spill), they are not likely to contribute to substantial sediment contamination in the future.

4.12.4 Biological Resources

Construction and operation of the Long Beach LNG Import Project would not result in the permanent loss of marine habitat; however, other projects identified in table 4.12-1 involve the creation of up to 508 acres of new land that would cause a permanent loss of marine habitat. These habitat alterations are increments caused by continued expansion of the ports and, collectively, are considered a significant impact. However, because the proposed project would not involve loss of marine habitat, it would not contribute to that impact.

The increased volumes of international cargo that present and reasonably foreseeable marine terminal projects are intended to accommodate would increase the number and size of ships that call at the ports of Long Beach and Los Angeles. In either case, the volumes of ballast water those ships would carry could increase the possibility that exotic marine species would be introduced into San Pedro Bay. This issue has been addressed at the federal and state levels, resulting in the institution of a program of mandatory ballast water exchange and reporting. The program covers all ships calling at California ports from overseas. Despite these measures, the exotic species issue remains potentially considerable as a result of the cumulative impacts of continuing port development and growth in international trade. The ships associated with the Long Beach LNG Import Project, however, are not expected to contribute to this cumulative impact. The ships would arrive at the terminal facility fully loaded with LNG from locations throughout the Pacific region. To maintain a constant draft during the unloading operation, the LNG ship would bring on ballast water during transfer of its LNG cargo and retain this ballast water until after the LNG ship departs the harbor. The absence of ballast water discharges within the harbor would decrease the potential for importing an exotic species during operation of the Long Beach LNG Import Project.

The 17 projects involving in-water activity have the potential to affect federally designated EFH in the harbor through construction-related turbidity and disturbance and, in the long term, the loss of up to 508 acres of open water. Even when all projects are considered cumulatively, the construction impacts would not be significant because of the control measures that would be employed (e.g., measures to reduce dredging impacts, implementing storm water pollution and spill prevention procedures, using special construction techniques to minimize in-water disturbance) and the small scale of disturbance relative to the extent of the habitat.

Seven species listed as federally threatened or endangered were identified as potentially occurring in the San Pedro Bay area. Of these seven species, there is a low potential for five to occur in the project area (the western snowy plover and the green, Ridley, loggerhead, and leatherback sea turtles). The other two species, the California brown pelican and the California least tern, are water-dependent birds that are common in San Pedro Bay and could be affected by the cumulative impacts associated with increasing development of the harbor complex. The California brown pelican, however, does not rely on the bay for breeding or nesting. In addition, roosting or feeding pelicans are generally acclimated to operations in the ports of Long Beach and Los Angeles, including construction and dredging activities. As a result, increasing development does not appear to represent a cumulatively significant impact on this species.

A large colony of California least terns nests on Pier 400 in the POLA and has traditionally foraged in the shallow water habitat west of the Navy Mole in Los Angeles and Long Beach harbors. The potential cumulative impact on the food supply from construction activities and loss of habitat associated with land fills is an issue that the ports and the applicable resource agencies have addressed through the consultation process under section 7 of the ESA. The Long Beach LNG Import Project would not result in the permanent loss or degradation of existing habitats and, therefore, would not contribute to cumulative impacts on this species.

American peregrine falcons are state-listed endangered species that are primarily found near large bodies of water where they feed on water birds. American peregrine falcons forage regularly in Los Angeles and Long Beach Harbors, and several pairs of peregrine falcons are known to nest within and near the ports of Los Angeles and Long Beach. Potential cumulative impacts on the American peregrine falcon could occur as a result of loss or degradation of foraging habitat and disruptive noise from construction and operation of multiple projects in the area. However, peregrine falcons in the project area have become acclimated to POLB operations, including construction and dredging activities. In addition, the Long Beach LNG Import Project would not result in the permanent loss or degradation of existing foraging habitat or significantly increase existing noise levels during construction and operation. Therefore, the proposed project would not contribute to cumulative impacts on this species.

4.12.5 Land Use

All of the projects identified in table 4.12-1 would be consistent with the land use policies and designations of the Cities of Long Beach and Los Angeles and their respective ports. In the harbor area, the projects would be industrial or commercial and port-related, which would conform to the approved PMPs. The LNG terminal would be an industrial use that generally conforms to the overall goals of the current PMP, local zoning ordinances, and relevant regional plans and would be consistent with existing surrounding uses. However, an amendment to the PMP would be necessary to accommodate the LNG facility because LNG is not an expressly identified “hazardous cargo” as permitted within Terminal Island Planning District 4 of the POLB. The projects in the City of Long Beach would be consistent with existing commercial and residential uses and conform to the city’s zoning and land use plans. As a result, the combination of identified projects would not significantly contribute to cumulative impacts on land use.

4.12.6 Recreation

Several of the existing or proposed projects would enhance recreational and leisure facilities and opportunities in the region (e.g., the Cabrillo Marine Aquarium Expansion, Cabrillo Way Marina - Phase II, Fishing Reef, San Pedro Waterfront Promenade, and hotel developments). While none of the existing or proposed industrial or commercial projects would displace any recreational facilities, continued port development may have a minor cumulative impact on recreational opportunities. The Long Beach LNG Import Project is not expected to contribute to any cumulative impacts on recreational activities because it would not adversely affect waters currently used for recreation.

4.12.7 Visual Resources

All of the projects identified in table 4.12-1 would be constructed in highly developed areas associated with the ports and Cities of Long Beach and Los Angeles. Construction and operation of new buildings or structures associated with these projects, including those at the LNG terminal, would have a permanent effect on visual resources. The cumulative impacts would not be significant, however, because the facilities would be seen in the context of the existing facilities in the area and would not adversely affect the viewshed from sensitive locations or change the character of the landscape in terms of either physical characteristics or land uses. The existing facilities at the ports of Long Beach and Los Angeles would screen, backdrop, and otherwise minimize the overall visual impact of these projects to less than significant levels.

4.12.8 Socioeconomics

The present and reasonably foreseeable future projects could cumulatively impact socioeconomic conditions in the project area, including population, employment, and housing; public service systems; utilities and service systems; and environmental justice.

Population, Employment, and Housing – The Long Beach LNG Import Project would not result in potentially significant impacts on population, employment, or housing; therefore, significant cumulative impacts would not occur as a result of this project in combination with the other projects identified in table 4.12-1.

Public Service Systems – The existing and proposed projects identified in table 4.12-1 may increase the demand for police and fire protection in the region. The increased demand would be consistent with the overall pattern of growth that the Cities of Long Beach and Los Angeles incorporate into their planning processes. Construction of the Long Beach LNG Import Project would not add to the cumulative demand for public services because the non-local workforce would be small relative to the current population. However, the proposed project would introduce a new product (i.e., LNG) to the POLB that also would be new to the local fire and emergency response services; therefore, operation of the project could add to cumulative impacts on the local public service systems in the event of an emergency at the LNG terminal. As discussed in section 4.6.5, the NASFM, the OPS, and the OEP are developing an LNG safety module that will be added to the firefighter safety program to train the local fire services. In addition, SES is working with local emergency providers to develop procedures to handle potential fire emergencies and is working with the LBFD to provide hazard control and firefighting training that is specific to LNG and LNG vessels. SES has also committed to funding all necessary security/emergency management equipment and personnel costs that would be imposed on state and local agencies as a result of the project and would prepare a comprehensive plan that identifies the mechanisms for funding these costs. These measures should adequately equip the LBFD to handle any type of emergency at the proposed LNG terminal. As a result, the proposed project would not

significantly contribute to cumulative impacts on public service systems. A discussion of cumulative impacts on emergency response times is presented in section 4.12.13.

Utilities and Service Systems – The proposed project would not result in potentially significant impacts on utility and service systems; therefore, significant cumulative impacts would not occur as a result of the proposed project in combination with the other projects identified in table 4.12-1.

Environmental Justice – Although the City of Long Beach could be characterized as poorer than average and has an over 50 percent minority population, there is no evidence that the project would result in cumulative impacts on any racial, ethnic, or socioeconomic group because the facilities would be located primarily within an existing industrial area associated with the POLB. In addition, all of the projects identified in table 4.12-1 would be consistent with the land use policies and designations of the Cities of Long Beach and Los Angeles and their respective ports as well as with the past development of the ports. A Health Risk Assessment was conducted to evaluate the potential for impacts on human health associated with air toxics (see section 4.9.7). The assessment concluded that the impact of the Long Beach LNG Import Project on human health risks would be less than significant; however, toxic air pollutants resulting from the project would likely contribute to cumulative air quality impacts in the SCAB (see section 4.12.11). As discussed in section 4.12.11, it is likely that the incremental increase in the cancer risk level for toxic air pollutants as a result of the proposed project would contribute to an existing cumulatively significant health impact in the SCAB. These health impacts could disproportionately affect the environmental justice communities located near the project area.

4.12.9 Transportation

Land Transportation – The future baseline traffic conditions discussed in section 4.7.2 were developed by considering the cumulative traffic effects of regional growth and traffic generated by other proposed developments in the POLB area. Traffic associated with construction and operation of the project was then added to the future baseline conditions to develop the cumulative impact scenarios for the proposed project. The traffic analysis is, therefore, representative of a cumulative traffic impact analysis of the proposed project and other reasonably foreseeable growth in traffic. During construction, cumulative traffic occurring in the evening at the Henry Ford Avenue/Anaheim Street intersection is likely to have a significant impact. The proposed Heim Bridge Replacement and State Route 47 Truck Expressway Projects would reduce this impact. However, if these projects do not go forward, the LADOT may require improvements at the Henry Ford Avenue/Anaheim Street [e.g., re-striping portions of the roads and/or imposing parking restrictions (see section 4.7.2.3)]. With implementation of these mitigation measures, no significant cumulative traffic impact is expected in the area as a result of construction or operation of the proposed project.

Marine Transportation – Cumulative projects could cause an increase in the amount of vessel traffic in San Pedro Bay and its approaches. As discussed in section 4.7.3.1, the POLB currently experiences about 3,085 ship calls, which results in about 6,170 inward and outward ship movements per year. By 2020, this total is expected to increase to between 10,400 and 15,200 inward and outward ship movements. Any increase would represent an increased risk of collision and groundings. To accommodate existing and future vessel traffic and to increase safety, the Los Angeles-Long Beach Marine Exchange and the Coast Guard established a VTS that manages vessel traffic in southern California waters. Because the VTS ensures the capacity of the two ports to handle future vessel traffic safely, the effect of cumulative project development on marine transportation is considered less than significant. In addition, the vessel traffic associated with the Long Beach LNG Import Project (i.e., 120 ship calls per year or 240 inward and outward ship movements) would represent only about 4 percent of current ship traffic and 2 percent of the total projected levels in 2020. As a result, the proposed project would not significantly contribute to cumulative impacts on marine transportation.

4.12.10 Cultural Resources

The Long Beach LNG Import Project would be constructed in areas that have undergone extensive previous disturbance. Accordingly, the proposed project would not contribute to cumulative impacts on cultural resources because no historic properties or unique archaeological resources would be affected. Each of the other existing or proposed projects would include mitigation measures designed to avoid or minimize impacts on cultural resources if present. As a result, no significant cumulative impacts on cultural resources are anticipated.

4.12.11 Air Quality

All of the projects identified in table 4.12-1 are located in the SCAB, which experiences chronic exceedances of state and federal air quality standards as described in section 4.9. All of the existing or proposed projects would have air emissions associated with construction and most would have air emissions during operation of the facilities. With the exception of the Pike at Rainbow Harbor (formerly the Queensway Bay Master Plan), all of the projects that have undergone environmental review would have emissions that represent significant impacts even after the incorporation of mitigation measures recommended by the SCAQMD. Air emissions associated with the Long Beach LNG Import Project are also expected to remain significant after implementation of SES' proposed control measures and the Agency Staffs' recommended mitigation measures. During construction of the proposed project, the SCAQMD significance thresholds would be exceeded for all criteria pollutants except SO_x on a peak daily and quarterly basis. During operation, the project's net emissions after SCAQMD-required emission offsets and implementation of SES' proposed control measures would exceed the daily SCAQMD significance thresholds for NO_x , ROC, PM_{10} , and SO_x . As a result, the existing and proposed projects are assumed to have both individually and cumulatively significant impacts on air quality.

Most of the impacts on air quality associated with the various projects would be attributable to emissions from mobile sources (e.g., construction equipment, terminal operating vehicles, marine vessels, trains, trucks, and on-road vehicles). Ongoing programs administered by the EPA, the CARB, and the SCAQMD would lessen those emissions by encouraging, and in some cases mandating, measures such as alternative fuels, reformulated diesel fuels, cleaner engines, and ride-sharing. In addition, the proposed project would make an alternative cleaner burning fuel (i.e., LNG) more available for distribution locally to fuel LNG-powered vehicles. As a result, there is a potential for air quality benefits associated with the proposed project because LNG-powered vehicles have lower emissions than diesel-powered vehicles. Nevertheless, the cumulative projects represent additions of potentially significant and unavoidable emissions in the SCAB.

As discussed in section 4.9.7, a Health Risk Assessment of toxic air contaminant emissions on humans was conducted for the Long Beach LNG Import Project in accordance with SCAQMD Rule 1401. The Health Risk Assessment concluded that the proposed project would not individually exceed cancer risk level significance thresholds established by the SCAQMD for toxic air pollutant health impacts; however, the total carcinogenic risk in the SCAB and the Port areas currently exceeds thresholds of significance based on data gathered in the MATES II Study. Therefore, even though project-specific toxic air pollutant health impacts would not be significant, it is likely that the incremental increase in the cancer risk level for toxic air pollutants as a result of the proposed project would contribute to an existing cumulatively significant health impact in the south-central Los Angeles area, the harbor area, and near freeways.

4.12.12 Noise

Construction and operation of the projects identified in table 4.12-1 would contribute noise and vibration to the environment and may raise the overall noise level as a result of increasing the intensity of site activities within the ports of Long Beach and Los Angeles and the City of Long Beach. If more than one project is constructed in the same place at the same time, cumulative impacts on noise could occur. As previously discussed, the demolition of buildings and the removal of pavement associated with the Long Beach Naval Complex Disposal and Reuse Project would be the only other project that would occur at the same place as the proposed project and those activities would be completed before SES' initiation of activities associated with the Long Beach LNG Import Project. During operation, the facilities associated with the proposed project would not produce vibrations and would be located over 1 mile from the nearest NSAs. In addition, the activities associated with all of the projects would be required to comply with applicable noise ordinances. Therefore, the cumulative impacts on noise and vibration would be considered less than significant.

4.12.13 Reliability and Safety

Impacts on reliability and public safety would be mitigated through the implementation of applicable federal, state, and local rules and regulations for each individual project. The specific rules and regulations that apply to each individual project would ensure that the applicable design standards are implemented to protect the public and to prevent accidents and failures. The LNG terminal facilities would be sited, designed, constructed, operated, and maintained in compliance with the federal safety standards summarized in table 2.7.1-1. The pipelines and aboveground facilities associated with the Long Beach LNG Import Project would be designed, constructed, operated, and maintained in accordance with DOT Minimum Federal Safety Standards in Title 49 CFR Part 192.

Several of the present or reasonably foreseeable future projects, including the proposed project, would involve cargo terminals that could be expected to ship hazardous materials. Accidents involving such materials represent a potential impact on public safety. Continued growth in international commerce is likely to result in increased quantities of hazardous materials being shipped to and from the region.

It is difficult to evaluate the cumulative risk that such growth represents or has represented. In addition, it is difficult to measure the cumulative risk for an intentional attack on the Port or the LNG facility. As discussed in section 4.11.10, the POLB Quest Study reported that the historical probability of a successful terrorist event would be less than seven chances in a million. The addition of the LNG facility and its associated LNG ships would not significantly change the risk of an intentional attack on the POLB. It is reasonable to assume that the rate of ship accidents (including those involving the release of hazardous materials) is likely to rise with more vessel traffic, which could cumulatively increase the risk of an accident having an impact on public safety. As previously discussed, the Los Angeles-Long Beach Marine Exchange and the Coast Guard established a VTS that manages vessel traffic and increases safety in southern California waters. The Coast Guard would also enforce a security zone around LNG ships. These and other operational controls by the Coast Guard, VTS, and Jacobsen Pilots and the characteristics of the POLB would minimize the risk of accidents involving LNG ships. Furthermore, the implementation of federal, state, and local rules and regulations concerning security and the results of the WSA with its associated operations and Emergency Response Plan would minimize the risk to the POLB and the LNG operation.

Emergency response time is a key aspect of public health and safety. Projects that increase traffic congestion or interfere with access are the most likely source of adverse impacts on response times. None of the projects identified in table 4.12-1 where the environmental analysis has been completed is expected to cause an increase in response times for emergency services. Cumulative impact on one intersection,

combined with the traffic associated with the proposed project, would likely result in significant impacts during construction. However, no significant cumulative impacts on emergency services are expected because sufficient emergency services and facilities exist in the area to accommodate cumulative projects, and because of mitigation measures that would reduce the cumulative traffic impact at this intersection (see sections 4.7.2.3 and 4.12.9). No significant cumulative impacts on emergency services are expected during operation of the proposed project. Section 4.11.9 includes the Agency Staffs' recommendation that SES prepare an Emergency Response Plan and coordinate procedures with local emergency planning groups, the ports of Long Beach and Los Angeles, fire departments, state and local law enforcement, the Coast Guard, and other appropriate federal agencies to be used in the event of an incident. As discussed in sections 4.6.5 and 4.11.7.4, SES has committed to funding all necessary security/emergency management equipment and personnel costs that would be imposed on state and local agencies as a result of the project and would prepare a comprehensive plan that identifies the mechanisms for funding these costs. With the implementation of the coordination procedures in the Emergency Response Plan and the funding of additional emergency management equipment and personnel, no cumulative impacts would be expected on emergency response services during operation of the proposed project.

4.13 GROWTH-INDUCING IMPACTS

The CEQA requires the consideration and discussion in an EIR of the growth-inducing impacts of the proposed project. Analysis of growth-inducing impacts includes characteristics of the proposed action that may encourage and facilitate activities that would, either individually or cumulatively, affect the environment. These activities include increases in population growth that could affect the economy, housing, and community services. For example, population increases could create demands for construction of additional housing and/or impose new burdens on existing community service facilities. Growth may be considered beneficial, adverse, or of no significance environmentally depending on its effects on the environmental resources present.

Most of the natural gas that would be supplied by the LNG terminal would be transported into the SoCal Gas system and would be used to meet existing and future natural gas demand in the LA Basin. The demand for energy is a result of, rather than a precursor to, development in the region. As discussed in section 1.1, currently, imports from out of state represent approximately 87 percent of supply and are anticipated to rise to 88 percent by 2013, meaning that additional external supplies will be needed to keep up with demand. Given the short- and mid-term demand for natural gas and the need to reduce potential supply interruptions, the CEC has identified the need for California to develop new natural gas infrastructure to access a diversity of fuel supply sources and to remove constraints on the delivery of natural gas. The LNG that would be made available for vehicle fuel would be used to meet existing and projected future demand and provide a new source of fuel to facilitate conversion of diesel or gasoline-fueled vehicles to LNG, which could reduce air emissions in the area.

Given the large local labor pool in Los Angeles and Orange Counties, no substantive influx of workers would occur during construction and operation of the Long Beach LNG Import Project. As a result, the project would not cause a significant increase in population or demand for housing. The project would have a beneficial impact on the local economy and employment because the majority of the construction and operation workforce is expected to be hired from the local labor pool. However, given the size of the regional economy, these benefits are not expected to result in significant growth-inducing impacts. Because the non-local workforce would be small relative to the current population, construction of the project facilities would not impact the local community facilities and services such as police, fire, and medical services. The LBFD's experience, extensive and comprehensive training in petroleum and shipboard firefighting; the training specific to LNG that would be provided by the NASFM, the OPS, the OEP, and SES; and the funding of additional emergency management equipment and personnel should adequately equip the LBPD and other local emergency providers to handle any type of emergency during operation of the proposed LNG terminal.